AD-A095 792 HENNINGSON DURHAM AND RICHARDSON SANTA BARBARA CA F/G 16/1
M-X ENVIRONMENTAL TECHNICAL REPORT. ENVIRONMENTAL CHARACTERISTI--ETC(U)
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UNCLASSIFIED M-X-ETR-19 AFSC-TR-81-34 NL

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M-X ENVIRONMENTAL TECHNICAL REPORT

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: AFSC-TR-81-34	2. GOVT ACCESSION NO.: AD-A095 792
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): M-X Environmental Technical Report, Environmental Characteristics of Alternative Designated Deployment Areas; Traffic	5. TYPE OF REPORT & PERIOD COVERED: Final Report
	6. PERFORMING ORG. REPORT NUMBER: MX ETR 19
7. AUTHOR(s): M-X-ETR-19	8. CONTRACT OR GRANT NUMBER(s): F04704-78-C-0029
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Henningson, Durham and Richardson, Santa Barbara CA 93010	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 64312F
11. CONTROLLING OFFICE NAME AND ADDRESS: Ballistic Missile Office, Norton AFB CA	12. REPORT DATE: 22 December 1980
	13. NUMBER OF PAGES: 113
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Unclassified/Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

MX	Traffic	Nevada
Siting Analysis	Roads	Texas
Environmental Report	Utah	New Mexico

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report is one of a series of technical reports which serve as back-up documentation to the Environmental Impact Statement for the M-X Project. It examines the impacts on traffic and transportation systems associated with the construction and operation of the M-X system. The proposed action and eight alternative system configurations are evaluated individually and the relative impacts of each are identified.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

SECURITY CLASSIFICATION OF THIS PAGE(*When Data Entered*)

SECURITY CLASSIFICATION OF THIS PAGE(*When Data Entered*)

M-X ETR-19

ENVIRONMENTAL CHARACTERISTICS OF ALTERNATIVE DESIGNATED DEPLOYMENT AREAS: TRAFFIC

Prepared for

United States Air Force
Ballistic Missile Office
Norton Air Force Base
California

By

Henningson, Durham & Richardson
Santa Barbara, California

22 December 1980

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INTRODUCTION

The proposed M-X system is a large-scale defense project which will cover large portions of two states and involve over 20,000 temporary construction workers and 13,000 permanent military and civilian employees. Approximately 8,000 mi of new roads will be constructed as part of the project, all of which will be open to the public, thus greatly expanding the road system in the area. Two permanent operating bases will be established creating large new employment centers which will cause a large migration into the area. Among other effects, this influx of people will cause large increases in traffic.

PURPOSE

This report is one of a series of technical reports which serve as back-up documentation to the Environmental Impact Statement for the M-X project. It examines the impacts on traffic and transportation systems associated with the construction and operation of the M-X system. The proposed action and eight alternative system configurations are evaluated individually and the relative impacts of each are identified.

SCOPE

This report addresses three main issues: the direct effects of M-X on the existing road system and accessibility within the area associated with construction of the project roads, the increases in traffic associated with increases in population, and the affect on railroad and airline service in the region. The primary emphasis is on traffic since it will cause the most significant impacts in the area in which the project is constructed.

The traffic analysis is based upon estimating the volume of traffic that will be generated by the project and evaluating the ability of the existing road system to accommodate it. Adverse impacts are identified as locations where congestion or other traffic problems will occur as a result of the increased traffic. Potential mitigation measures are identified that could offset some of the adverse impacts of the project. The corresponding increases in air pollution, noise, and fuel consumption are discussed in other technical reports.

During the operations phase, the primary emphasis in this study is placed upon the road systems in the immediate vicinity of the operating bases. No effort was made to analyze traffic on the bases themselves since they have not been designed. Moreover, traffic on the bases themselves will not affect the existing road system. Traffic movements within communities near the operating bases were not specifically identified in most cases since specific growth patterns that would occur are not known even through considerable development in terms of new housing units, schools, commercial facilities, etc., will be required. Where this development will occur has not been specifically identified at this point, thus an accurate assessment of the total magnitude and the location of traffic problems within the communities generated by the M-X project is not yet possible. However, communities that will likely experience large increases in traffic which may in turn cause congestion on the existing street system are identified.

Standard traffic forecasting and capacity analysis techniques are used in this analysis. The basic principle in traffic forecasting is that the volume of traffic in a particular area is proportional to the number of people who live, work, shop, socialize or pursue other interests in the immediate vicinity. Therefore, traffic estimates can be made if the number of people that will engage in those activities is known. The M-X project will cause an increase in traffic as a result of people moving into the area to fill the jobs that will be created. These people are expected to engage in activities, including travel, in a manner typical of people living and working in similar situations, therefore standard traffic estimating and analysis procedures can be applied. A detailed description of the methodology used to estimate future traffic is contained in Chapter 6.

1.0 PROJECT DESCRIPTION

The proposed M-X system would consist of two operating base complexes and the Designated Deployment Area (DDA). The first operating base would employ 7,500 military and civilian personnel and the second base would employ 5,700 personnel. The DDA would consist of 200 clusters interconnected by a road network called the Designated Transportation Network. Each cluster would contain 23 protective shelters interconnected by a cluster road. Table 1-1 is a listing of the nine alternatives system layouts including the Proposed Action.

The M-X project will significantly affect the transportation system in the area in which it is constructed in two ways: it will greatly expand the existing road system and it will cause large increases in traffic on the existing road system.

Construction and operation of the M-X system will also cause an increase in demand for railroad and airline services but the impacts are not expected to be significant. These are discussed in Chapter 7.

1.1 PROJECT ROADS

Up to 8,000 mi of new roads will be constructed as part of the M-X system. These roads will increase access and enhance the existing road network in the region in which the project is constructed. Moreover, the project roads will be utilized by most of the construction and operations traffic thus minimizing conflicts with existing traffic. All project roads will be available for use by the public.

The project roads will be composed primarily of two types, the Designated Transportation Network (DTN) and the cluster roads. Additional temporary construction roads will also be constructed. The DTN will connect the DAA at the first operating base with each of the clusters. It will be a 24-ft-wide paved roadway between 1,200 and 1,600 mi long, depending on the alternative configuration selected. The DTN will cross numerous existing roads but will be designed to avoid traffic conflicts. At intersections of all state and federal routes and all county roads with traffic in excess of 500 vehicles per day and with all railroads, grade separations will be constructed.

There will also be approximately 6,000 mi of cluster roads divided between 200 clusters. Each cluster will have approximately 30 mi of road connecting each of 23 protective structures with the cluster maintenance facility and the DTN. These will be 21-ft-wide unpaved roads composed of stabilized base material and treated to control dust. The cluster roads will primarily be constructed on new alignment but about 20 percent of the total length will utilize existing roads which will be upgraded to meet design vehicle requirements. The cluster roads will be specifically designed to avoid intersecting or collocating with any road that has average traffic over 250 vehicles per day.

1.2 TRAFFIC

The elements which will cause the largest impact are the traffic generators (primarily the construction camps and bases). These elements will increase the number of jobs in the region, which will, in turn, cause an increase in population. This influx of people will directly cause an increase in traffic. The distribution of

Table 1-1. Operating base complex locations and components for Proposed Action and alternatives.

ALTERNATIVE	FIRST OB COMPLEX		SECOND OB COMPLEX	
	LOCATION	SYSTEM COMPONENTS	LOCATION	SYSTEM COMPONENTS
Proposed Action	Coyote Spring Valley, Nevada	OB, DAA, OBTS, Airfield	Milford, Utah	OB, Airfield
1.	Coyote Spring Valley, Nevada	OB, DAA, OBTS, Airfield	Beryl, Utah	OB, Airfield
2.	Coyote Spring Valley, Nevada	OB, DAA, OBTS, Airfield	Delta, Utah	OB, Airfield
3.	Beryl, Utah	OB, DAA, OBTS, Airfield	Ely, Nevada	OB, Airfield
4.	Beryl, Utah	OB, DAA, OBTS, Airfield	Coyote Spring Valley, Nevada	OB, Airfield
5.	Milford, Utah	OB, DAA, OBTS, Airfield	Ely, Nevada	OB, Airfield
6.	Milford, Utah	OB, DAA, OBTS, Airfield	Coyote Spring Valley, Nevada	OB, Airfield
7.	Clovis, New Mexico	OB, DAA, OBTS, Airfield	Dalhart, Texas	OB, Airfield
8.	Coyote Spring Valley, Nevada	OB, DAA, OBTS Airfield	Clovis, New Mexico	OB, DAA, Airfield
No Action	—	—	—	—

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this traffic is dependent primarily upon the location of the employment centers and the associated residential communities. The principal traffic generators will be the construction camps during the construction phase and the operating bases during the operations phase. Additional traffic generators will be the communities near the operating bases, which are expected to provide housing for military and civilian employees who will not reside on the bases or in the construction camps.

The effects on transportation as a result of the M-X project can be divided among the three phases of implementation--construction, assembly and checkout (A&CO), and operations. The construction phase extends from 1982 to 1989. A&CO includes installation of equipment and inspection of the facilities and begins in 1982 and ends in 1990. The operations phase begins in 1986 with the delivery of the first missile to its designated cluster. An additional impact that would occur outside the deployment area is the movement of missile components from their place of assembly to the first operating base complex. This is discussed in additional detail in Section 1.2.3.

Traffic within the DDA during the construction phase will primarily be composed of two types: construction traffic itself, and commute and recreational trips of the construction workers. Most of the construction traffic itself will utilize the project roadways for travel between the construction camps and the work areas. Consequently, there will be few conflicts with traffic on existing roads. Commuting and recreational trips, on the other hand, will utilize the existing road system. The specific effects will depend upon the location and size of the construction camps and the number of construction workers that live in neighboring communities rather than the construction camps.

Traffic during the operations phase will primarily be centered in and around the operating bases where the large majority of people associated with the project will live and work. Traffic will be influenced by the normal day-to-day activities of people traveling between their homes and work, schools, shopping, etc. There will also be some traffic associated specifically with the operation and maintenance of the M-X system but this will be small in comparison.

CONSTRUCTION (1.2.1)

During the construction of the DDA most of the traffic will center around the construction camps. This will include not only the movement of construction equipment but also deliveries of materials and supplies and commuting and recreation trips of the workers. Most of the construction traffic itself will remain on the project roads, principally the DTN and cluster roads, which will not affect traffic on the existing road system except at intersections where motorists will be stopped occasionally by crossing construction vehicles. However, worker's commuting and recreation trips will utilize the existing road system and will affect non-M-X-related traffic.

There will be up to 20 construction camps located throughout the deployment area. On the average they will be about 30 mi apart and will employ between 1,500 and 2,500 construction workers. Each will be in operation for approximately two to three years, and staggered throughout the course of the project.

It is anticipated that about half of the construction workers will reside at the self-contained construction camps and will not be accompanied by their families.

This will hold down the total traffic associated with each construction camp, since dependent trips will be lower than would otherwise be expected if families accompanied the workers. Peak traffic demands on the existing road network will occur during shift changes (such as on weekends) when workers leave the construction camps for recreation or to return to their permanent homes.

Three types of construction traffic will be generated by the M-X project in the deployment area:

- Commuting and recreational trips by construction personnel
- Construction and field work traffic
- Indirectly generated traffic including dependents, service operations, and traffic generated by indirect employment away from the construction area

Analysis of the commuting and recreation traffic assumed that a portion of the construction and A&CO personnel will choose to establish living quarters away from the construction camps. The majority of these trips will be via the existing road network between the construction camps and living quarters. These trips will be made by passenger vehicles principally during a one-hour band bracketing the normal working hours.

In addition to the above daily work trips, personnel are also assumed to take several recreation-oriented trips during the construction period. These trips will primarily be taken on weekends and will utilize the existing highway system.

Construction and field work traffic will be generated at the construction camps and will travel between the camps and the locations of construction activity. This traffic will primarily be concentrated on the DTN and the cluster roads since it will provide the most direct connection between the individual protective structures and the camps.

The volume and location of construction traffic will vary for each alternative since construction camp locations and sizes as well as scheduling will be different for all of them. The specific project effects for construction traffic are discussed individually in Chapter 5.

ASSEMBLY AND CHECKOUT (1.2.2)

Table 1.2.2-1 shows the A & CO traffic that is expected within the deployment area. It includes all traffic between the operating bases and the deployment area. Within any area, peak A&CO traffic is generally not expected to occur simultaneously with peak construction traffic, although the two activities will overlap to some degree. It will also use project roads to a great extent. Project estimates include both A & CO traffic and construction traffic for daily work activities in the DDA.

MOVEMENT OF MISSILE COMPONENTS (1.2.3)

The M-X missile itself will be constructed in components in four different cities and shipped to the bases by either railroad or truck. Stage one will be the largest component, weighing approximately 100,000 pounds, not including its

Table 1.2.2-1. Assembly and Checkout (A & CO) vehicle traffic

VEHICLE TYPE	ROUTE ORIGIN - DESTINATION	TRIPS PER WEEK
	OB/CSA/DAA - DAA	
Light Vehicles		768
(Personnel & Small Vehicles		
Medium/Heavy Vehicles		
Cargo Van Truck		65
Semi-trailer Van		49
Flatbed Truck		98
Semi-trailer flatbed		3
Semi-trailer lowbed		11
Personnel Bus		2
Tank Truck		12
RTV		5
	TOTAL	1013
	FIELD DISPATCH STATION - Field Work Sites	
Light Vehicles		626
Security		250
Medium/Heavy Vehicles		
Personnel Bus		320
Tank Truck		24
Cargo Van Truck		349
Mobile Crane		5
Tractor Rig		25
	TOTAL	1599
	PERSONNEL LIVING AREAS - OB/DAA	
Light Vehicles		2720
	PERSONNEL LIVING AREAS - Field Dispatch Station	
Light Vehicles (Based on 10 percent of field crew not using Dispatch Housing)		1200
		3246

Source: M-X basing area traffic analysis (study M-5 B/M), May 29, 1980, Boeing Co.

shipping container. It will be constructed in Brighton City, Utah, and shipped via railroad. While it will be a large load requiring special security measures, it will be within the size and weight limits normally carried by railroads.

Stages two, three, and four will be constructed in Sacramento, California; Salt Lake City, Utah; and Los Angeles, California, respectively. Stage two, including its shipping container, will exceed the weight limits for the state and federal highways over which it will pass and all three stages will probably exceed the size limits depending upon the size of their shipping container. Consequently, all shipments will require permits from each of the states through which they will pass.

Shipping oversize loads is common practice in all states and does not pose an unusual or adverse impact. The permitting process ensures that oversize loads are handled in a manner that does not damage the roadways, present safety problems, or disrupt the normal flow of traffic to a significant degree.

Two hundred shipments of each component will be required at the rate of approximately five per month over a period of about four years.

OPERATIONS (1.2.4)

DDA (1.2.4.1)

DDA traffic during the operations phase will be very light. Missile carrying vehicles from the DAA will be confined to the DTN and will make only 160 trips per year. The special transporter/mobile launcher will, on the average, make 6 trips per year per cluster and will remain entirely on individual cluster roads. Table 1.2.4.1-1 is a listing of expected operations traffic.

Operating Bases (1.2.4.2)

During the operations phase most vehicle activity will be centered in and around the operating bases. The bases will be self-contained facilities with 80 percent of the military personnel and their dependents living on the base. Consequently, the large majority of base-generated traffic will remain on the base itself and will not utilize the adjacent road system.

A significant volume of traffic will also be generated within local communities as a direct result of the project. All civilian employees and 20 percent of the military personnel and their dependents will live in communities adjacent to or within commuting distance of the bases. They will generate trips to the base as well as trips internal to the specific communities in which they reside. Moreover, persons moving into the area as a result of the M-X induced growth, who do not work on the base, will also generate trips within the communities in which they live.

The offbase housing and associated facilities are not a part of the M-X planned facilities and will likely be the product of private developers. At this stage of the planning process, it is not possible to predict the specific growth patterns and the corresponding traffic around each proposed base location. Traffic estimates were based upon "likely scenarios" of growth.

Traffic assignments near the operating bases and the corresponding project effects depend upon where people live and work. The major new employment center

Table 1.2.4.1-1. Operation and support vehicle traffic.

VEHICLE TYPE	ORIGIN	ROUTE DESTINATION	TYPE OF ROAD UTILIZED	ANNUAL TRIPS[2] (AVERAGE MILES)	COMMENTS
Special Transport Vehicle	OB/DAA	CMF	DTN	160 (400)	Requires 2 escort vehicles
Special Transporter/ Mobile Launcher	PS/CMF	PS/CMF	Cluster Roads	1,200 (31)	
Bulldozer (Tractor and Low Bed)	ASC	Cluster barrier	DTN and/or existing roads	140-160	Barrier removal
Cluster Lid Vehicles (3) Overburden Removal Crane Front Loader (Tractor/ Low Bed)	ASC	Cluster	DTN and/or existing roads	450	SAL shelter lid removal and replacement
Crew Bus (Maintenance)	ASC	Cluster	DTN and/or existing roads	1,300-2,800 (100)	Transport field maintenance crew to job
Crew Bus (40-man)	OB/DAA	ASC	DTN and/or existing roads	2,550-3,850 (400)	Five-day duty cycle at ASC
Security Crew Van (2-man)	ASC	Cluster	DTN and/or existing roads	37,230 (100)	Roving patrol replaced every 8 hours
Roving Patrol Vehicle	ASC	Cluster	DTN and/or existing roads	10,400 (200)	Patrol vehicles returned to ASC weekly for maintenance
Gasoline Tank Truck	OB/ASC	ASC/SAF	DTN and/or existing roads	TBD	Consumption primarily determined by roving patron requirement

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[1]Excludes road maintenance and administrative vehicles.

[2]Total M-X basing area round trips.

is established by the location of the base. Where people who are not provided quarters on the base will reside is a function of a number of site-specific variables including: distance from the base to other urban areas, available transportation network, the number of people needing homes off the base, size of nearby communities, land use planning policies, likelihood of further development, attractiveness of the area, and many other factors. In order to make traffic assignments it is necessary to estimate, or make assumptions, on where people will choose to live and where development will occur. The specific project effects are dependent upon these assumptions.

For each proposed base location, estimates were made on where people would live. The basis for these assumptions and the corresponding traffic assignments were made for traffic analysis purposes only and are not meant to be a prediction or recommendation of specific growth patterns in the area. Actual growth may be considerably different. Without traffic assignments, however, it would be difficult to gauge the effects of the anticipated traffic on the existing road system.

The analysis examined the specific effects on existing operations at a selected point in the operations phase of the project. Baseline traffic for the year 1992 was selected for analysis purposes since it is the first year of steady-state operations without the construction and A & CO personnel. Baseline traffic was developed using current traffic data, evaluation of population trends in the vicinity of the bases, and by translating these trends into traffic increases. Operating base traffic was then superimposed upon baseline traffic.

M-X-related trips during the operation phase near the bases are broken down into four basic types:

- traffic internal to the base (both the origin and destination of a trip are on the base)
- traffic between the base and neighboring communities
- traffic between communities or to other destinations not including the base
- traffic internal to communities (both the origin and destination of a trip are within a specific community)

The trips internal to the base will have no effect on the adjacent road system since they will remain entirely on the base.

During the construction of the operating bases, there would be a large influx of people into the nearby communities who would only remain a few years. The impacts associated with this temporary movement could occur in either of two ways depending upon how the local communities planned for it. If no special provisions were made to accommodate this short-term growth, the associated increases in traffic would likely strain the existing road system, exceeding capacity at critical intersections and along major streets. Congestion at these locations, especially during peak periods, would result. However, once the construction period was over, the traffic would subside to the levels anticipated for the long-term operations phase.

On the other hand, if the road system was expanded to the extent necessary to accommodate the short-term traffic levels, then traffic would flow smoothly, but the cost of expanding the road system would be a major impact. Once the short-term effect was over, the road system would be more than adequate to accommodate the long-term traffic levels. In either case, the short-term impacts associated with increases in traffic would be significant.

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2.0 SUMMARY OF IMPACTS

The transportation system within the project area might be significantly affected in two ways: it may be greatly expanded thus improving accessibility within the region, and traffic may increase on the existing road system as a result of the influx of people into the region.

The impact on accessibility is measured in terms of the degree of improvement of the road system in the area. The impact on traffic is measured by the increase in traffic on the road system. The indirect impacts associated with increases in traffic and accessibility, such as noise, air pollution, use of recreation facilities, disturbance of sensitive areas, etc., are discussed within the DEIS and within other technical reports.

PROPOSED ACTION

DDA

The proposed action would involve construction of approximately 8,500 mi of new roads in an area of the Great Basin which presently has relatively poor access. Figure 2-1 shows the existing road system within the affected region and recent traffic data. Roads constructed for the project would be open to the public producing a long term change in the accessibility in the area. This expansion of the road system would increase the accessibility into and within the region which could encourage development and facilitate use of the area for recreation. This would, in turn, increase the potential for damage to sensitive resources in formerly remote areas. Without this project it is unlikely that many new roads would be constructed in the region except in the immediate vicinity of other major projects which may be constructed. Table 2-1 summarizes the impacts on accessibility and their significance for each of the subunits in the area.

The temporary influx of people into the region during the construction period would also cause a large increase in traffic within the DDA during that period. The impacts due to this increase in traffic would be greatest near construction camps and within nearby communities due to the presence of supply trucks, personnel buses, and private vehicles belonging to construction workers. While the total amount of traffic that might use the existing road network would, in most cases, not exceed its capacity, it would be substantially higher than current levels. this would cause occasional delays and inconvenience to motorists. In mountain passes, where capacity is severely reduced by steep grades and winding alignment, congestion might occur at times due to slow moving trucks or buses or construction workers commuting from nearby communities. The impacts would be relatively short-term because each of the camps would be in use for only two to three years. Table 2-1 summarizes the projected traffic impacts during construction within the DDA.

Communities within the region, especially those near construction camps, will be affected both by traffic increases associated with temporary population increases and by traffic passing through them to other destinations, such as construction camps. While this traffic will only be temporary, some street improvements such as widening or installation of traffic signals may be required at some locations in order to accommodate the traffic. The two communities likely to be affected the most are Tonopah and Ely.

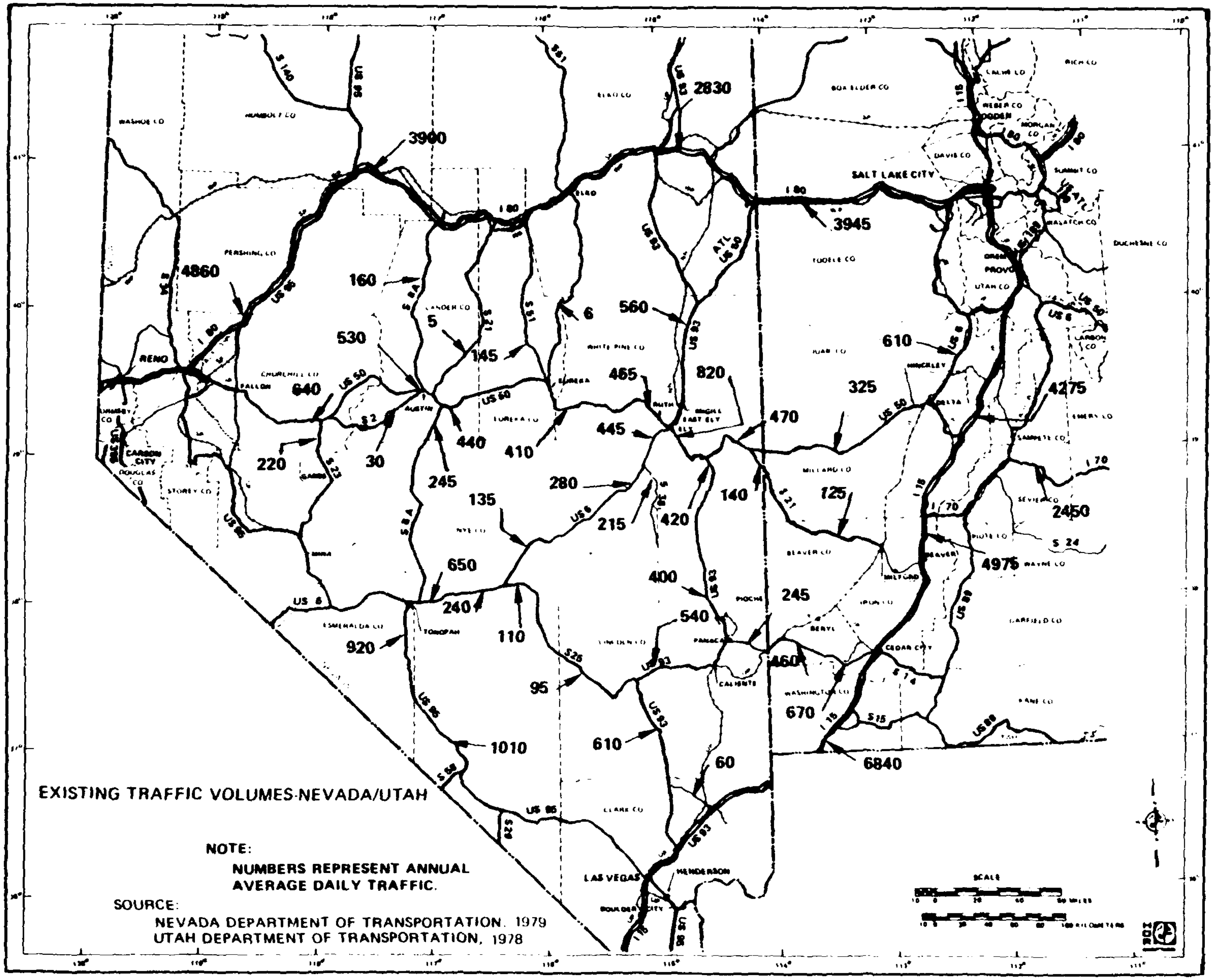

Figure 2-1. Existing road system and traffic volumes - Nevada/Utah.

Table 2-1. Potential impacts to accessability and short-term impacts on traffic in Nevada/Utah for the Proposed Action and Alternative 1 through 6.

HYDROLOGIC SUBUNIT		TRAFFIC	ACCESSIBILITY
NO.	NAME	SHORT-TERM IMPACT[1]	LONG-TERM IMPACT[2]
	Subunits with M-X Clusters and DTN		
4	Snake	Moderate	Moderate
5	Pine	Moderate	Moderate
6	White	Moderate	No
7	Fish Springs	Low	No
8	Dugway	Low	No
9	Government Creek	No	No
46	Sevier Desert	Moderate	No
46A	Sevier Desert & Dry Lake[3]	Moderate	No
54	Wah Wah	Moderate	Moderate
137A	Big Smoky-Tonopah Flat	Low	No
139	Kobeh	Moderate	No
140A	Monitor—Northern	Low	Moderate
140B	Monitor—Southern	No	No
141	Ralston	Moderate	No
142	Alkali Spring	Low	No
148	Cactus Flat	No	No
149	Stone Cabin[3]	Moderate	Moderate
151	Antelope	Moderate	No
154	Newark[2,3]	Moderate	No
155A	Little Smoky—Northern	Moderate	No
155C	Little Smoky—Southern	Low	No
156	Hot Creek	Low	No
170	Penoyer	Low	No
171	Coal	Moderate	High
172	Garden	Low	High
173A	Railroad—Southern	Moderate	Moderate
173B	Railroad—Northern	Low	Moderate
174	Jakes[3]	Low	No
175	Long	Moderate	No
176B	Butte—South	Low	Moderate
179	Steptoe	Low	No
180	Cave	Low	Moderate
181	Dry Lake[3]	Moderate	Moderate
182	Delamar	Low	Moderate
183	Lake	Moderate	No
184	Spring	No	No
196	Hamlin	Low	High
202	Patterson	No	No
207	White River	Low	Moderate
208	Pahroc	No	No
209	Pahranagat	No	No

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[1]
- No impact. (No or insignificant increase in traffic.)
- Low impact. (Some increases in traffic is expected; however, no road improvements should be required.)
- Moderate impact. (Increases in traffic likely to cause delay or inconvenience to motorists. Minor road improvements may be required at critical locations.)
- High impact. (Major increases in traffic expected which could generate requirements for substantial road system improvements.)

[2]
- No impact.
- Low impact. (New roads will only slightly improve access.)
- Moderate impact. (Quality of roads substantially improved.)
- High impact. (High quality roads constructed in areas where only a few or poor quality roads currently exist.)

[3]Conceptual locations of Area Support Centers (ASCs).

Most of the construction traffic itself would use the project roads which are specifically designed to avoid intersections with heavily or even moderately travelled roadways. At locations where project roads crossed existing roads there would be occasional delays to some motorists by the crossing of construction vehicles.

The anticipated increases in traffic on the existing roads would likely increase the maintenance efforts needed to keep the roads in good condition, especially during the construction period when heavy supply trucks would be using the existing roads.

During the operations phase only a small amount of traffic would use the existing roads in the DDA, consequently there will be no long-term impacts on traffic.

OPERATING BASES AND THEIR VICINITIES

In the vicinities of the operating bases the major impacts would be due to increases in traffic on the existing road system which would cause inconveniences and delays to motorists, increase the amount of maintenance required, and may necessitate major road improvements. Within communities near the bases, major additions to the street system would be required to analyze the traffic patterns on the base itself since site-specific base layouts have not been developed.

The trips between the base and neighboring communities were assigned to the most direct route. The trips between communities and other destinations were also assigned to the most direct route. No attempt was made to identify specific streets affected by the above trips since this was beyond the scope of this study. No estimate was provided for internal trips within communities because of the high *variability associated with growth.*

COYOTE SPRING

The first operating base would be constructed at Coyote Spring under the proposed action. Once the base is operational, approximately 2,400 military and civilian personnel would be commuting to the base from neighboring communities, primarily Las Vegas. A comparable amount of construction workers would be commuting during peak construction activity. In order to accommodate this traffic, U.S. 93 between the base and I-15 would have to be widened to four lanes unless mitigation measures such as staggered work shifts or substantial use of buses or carpools are implemented. Traffic along State Route 7 will also increase considerably but it would still not exceed the available capacity. Within Las Vegas and other nearby communities, such as in Moapa Valley, improvements to the major streets may be required at some locations. This would include street widening or installation of traffic signals. The specific improvements that may be required depend upon where the new development actually occurs.

MILFORD

Under the Proposed Action the second operating base would be at Milford. The proposed site currently has access via unpaved roads only. If only the road to Milford were improved it would have to be widened to four lanes in order to

accommodate the anticipated traffic. If the road to Minersville were also improved, two lanes would be adequate for both roads. This would also significantly reduce the amount of traffic that would have to pass through Milford to get to the base. Some roadway improvements to existing streets would be required in Milford in either case. Some improvements may also be required in other communities also, such as Minersville.

ALTERNATIVE 1

This alternative would utilize the same DDA as the Proposed Action as well as the first operating base at Coyote Spring. The second operating base would be at Beryl. In order to accommodate the anticipated traffic, the road between Beryl and Beryl Junction would have to be improved and widened to four lanes. Other minor improvements may also be required but, in general, the existing road system near the base would accommodate the anticipated traffic without congestion. Table 2-2 summarizes the projected impacts on traffic near the Beryl operating base site. Within the nearby communities, primarily Newcastle, Enterprise, and Cedar City, some improvements would be required on major streets in order to accommodate the anticipated traffic.

ALTERNATIVE 2

The overall impacts for this alternative would be the same as for the Proposed Action except in the vicinity of the second operating base, which would be at Delta. Due to the anticipated increase in traffic, U.S. 50 between the proposed site and Delta would have to be widened to four lanes, but other roads in the vicinity should adequately accommodate the anticipated traffic although the volumes would increase substantially. Since most of the offbase development would be expected to occur within or near Delta, improvements to the major streets may be required at some locations. Table 2-2 summarizes the projected impacts on traffic near the Delta operating base site.

Because the proposed site is near a construction camp location, the short-term cumulative impacts during the construction period will be greater than that associated with construction of the second operating base under the Proposed Action.

ALTERNATIVE 3

This alternative utilizes the same DDA as the Proposed Action but the operating base locations are different. The first operating base would be near Beryl and the second operating base would be near Ely.

Near Beryl the traffic impacts would be similar to those discussed for Alternative 1, but since it would be the first operating base in this case, traffic volumes would be about 20 percent higher.

Near Ely, the increase in traffic along U.S. 6-50-93 between the proposed site and Ely may require widening the road to four lanes. Most of the other roads in the vicinity would also experience increases in traffic but should be able to accommodate the traffic without congestion. Within Ely itself, the anticipated traffic, especially along U.S. 50, would approach the capacity of the existing road making

Table 2-2. Potential long-term impacts on traffic in Nevada/Utah for the Proposed Action and alternatives 1 through 6.

HYDROLOGIC SUBUNIT		LONG-TERM TRAFFIC IMPACTS[1]				
NO.	NAME	BERYL, UTAH OB ALTS. 1,3,4	COYOTE SPRING VALLEY NEVADA OB P.A. & ALTS. 1,2,4 & 6	DELTA, UTAH ALT. 2	ELY, NEVADA OB ALTS. 3,5	MILFORD, UTAH P.A. & ALTS. 5,6
	Subunits with OB Suitability Areas					
4	Snake	No	No	No	No	No
5	Pine	No	No	No	No	No
6	White	No	No	No	No	No
7	Fish Springs	No	No	No	No	No
8	Dugway	No	No	No	No	No
9	Government Creek	No	No	No	No	No
46	Sevier Desert	No	No	High	No	No
46A	Sevier Desert-Dry Lake[2]	No	No	High	No	No
54	Wah Wah	No	No	No	No	No
137A	Big Smoky-Tonopah Flat	No	No	No	No	No
139	Kobeh	No	No	No	No	No
140A	Monitor—Northern	No	No	No	No	No
140B	Monitor—Southern	No	No	No	No	No
141	Ralston	No	No	No	No	No
142	Alkali Spring	No	No	No	No	No
148	Cactus Flat	No	No	No	No	No
149	Stone Cabin[2]	No	No	No	No	No
151	Antelope	No	No	No	No	No
154	Newark[2]	No	No	No	No	No
155A	Little Smoky—Northern	No	No	No	No	No
155C	Little Smoky—Southern	No	No	No	No	No
156	Hot Creek	No	No	No	No	No
170	Penoyer	No	No	No	No	No
171	Coal	No	No	No	No	No
172	Garden	No	No	No	No	No
173A	Railroad—Southern	No	No	No	No	No
173B	Railroad—Northern	No	No	No	No	No
174	Jakes[2]	No	No	No	No	No
175	Long	No	No	No	No	No
178B	Butte—South	No	No	No	No	No
179	Steptoe	No	No	No	High	No
180	Cave	No	No	No	No	No
181	Dry Lake[2]	No	No	No	No	No
182	Delamar	No	No	No	No	No
183	Lake	No	No	No	No	No
184	Spring	No	No	No	No	No
196	Hamlin	No	No	No	No	No
202	Patterson	No	No	No	No	No
207	White River	No	No	No	No	No
208	Pahroc	No	No	No	No	No
209	Pahranagat	No	No	No	No	No
	Other Affected Subunits					
48	Beaver	No	No	No	No	Moderate
50	Milford	No	No	No	No	High
51	Maggie Creek	Moderate	No	No	No	Moderate
52	Lund District	Low	No	No	No	High
53	Beryl-Enterprise	High	No	No	No	High
210	Coyote Spring	No	High	No	No	No
212	Las Vegas	No	Moderate	No	No	No
216	Garnet	No	Moderate	No	No	No
217	Hidden—North	No	Moderate	No	No	No
218	California Wash	No	Moderate	No	No	No
219	Muddy River Springs	No	High	No	No	No
220	Lower Moapa	No	Moderate	No	No	No

3913-2

[1]
- No impact. (No or insignificant increase in traffic on existing roads.)
- Low impact. (Some increase in traffic is expected; however, no road improvements should be required.)
- Moderate impact. (Increase in traffic likely to cause occasional delay or inconvenience to motorists. Minor road improvements may be required at critical locations.)
- High impact. (Major increases in traffic expected which could generate requirements for substantial road system improvements.)

[2]Conceptual location of Area Support Centers (ASCs).

improvements necessary to avoid congestion during peak period. Table 2-2 summarizes the projected impacts on traffic near the Ely operating base site.

As in the case of Delta, Ely would have short-term traffic impacts associated with construction at the DDA as well as the operating base.

ALTERNATIVE 4

The impacts would be similar to those identified for Alternative 1. The only difference is that Beryl would be the first operating base in this case and therefore projected traffic levels will be about 20 percent higher (as in Alternative 3) and Coyote Spring Valley would be the second operating base and therefore projected traffic levels would be about 20 percent less.

ALTERNATIVE 5

The impacts within the DDA would be comparable to the Proposed Action. Milford, however, would be the first operating base in this alternative, consequently projected traffic levels would be about 20 percent higher than for the Proposed Action. The second operating base would be at Ely and the impacts would be the same as discussed for Alternative 3.

ALTERNATIVE 6

The impacts would be the same as for the Proposed Action except that the location of the first and second operating bases would be switched. Projected traffic levels would be about 20 percent higher near Milford (as in Alternative 5) and about 20 percent lower near Coyote Spring Valley (as in Alternative 4).

ALTERNATIVE 7

The same types of impacts that are anticipated for the Proposed Action in Nevada/Utah would occur for this alternative in Texas/New Mexico but not necessarily to the same degree. Within the DDA the existing road network is already extensive and accessibility is good to most areas. Therefore the increase in accessibility and the corresponding indirect impacts would be substantially less than in Nevada/Utah. There are few areas in this region that are not already accessible so that the addition of the project roads would not be as likely to encourage more travel or more development as it would in Nevada/Utah. Figure 2-2 shows existing highways in the area and current traffic levels.

In general, traffic increases within the DDA would not exceed the capacity of the road system primarily because of the relatively low volume of traffic currently using the roads and because construction activity would be spread out over a wide area. Some inconvenience and delay in the short term may occur near the construction camps and within some of the small communities in the area. Nevertheless, the amount of inconvenience and delay would be of relatively short duration. The traffic associated with construction may increase the amount of maintenance required on the existing roads. Table 2-3 summarizes the projected impacts in the DDA and for the operating bases.

The anticipated project related traffic in the communities of Dimmitt and Hereford may overload the existing street system during the time when nearby

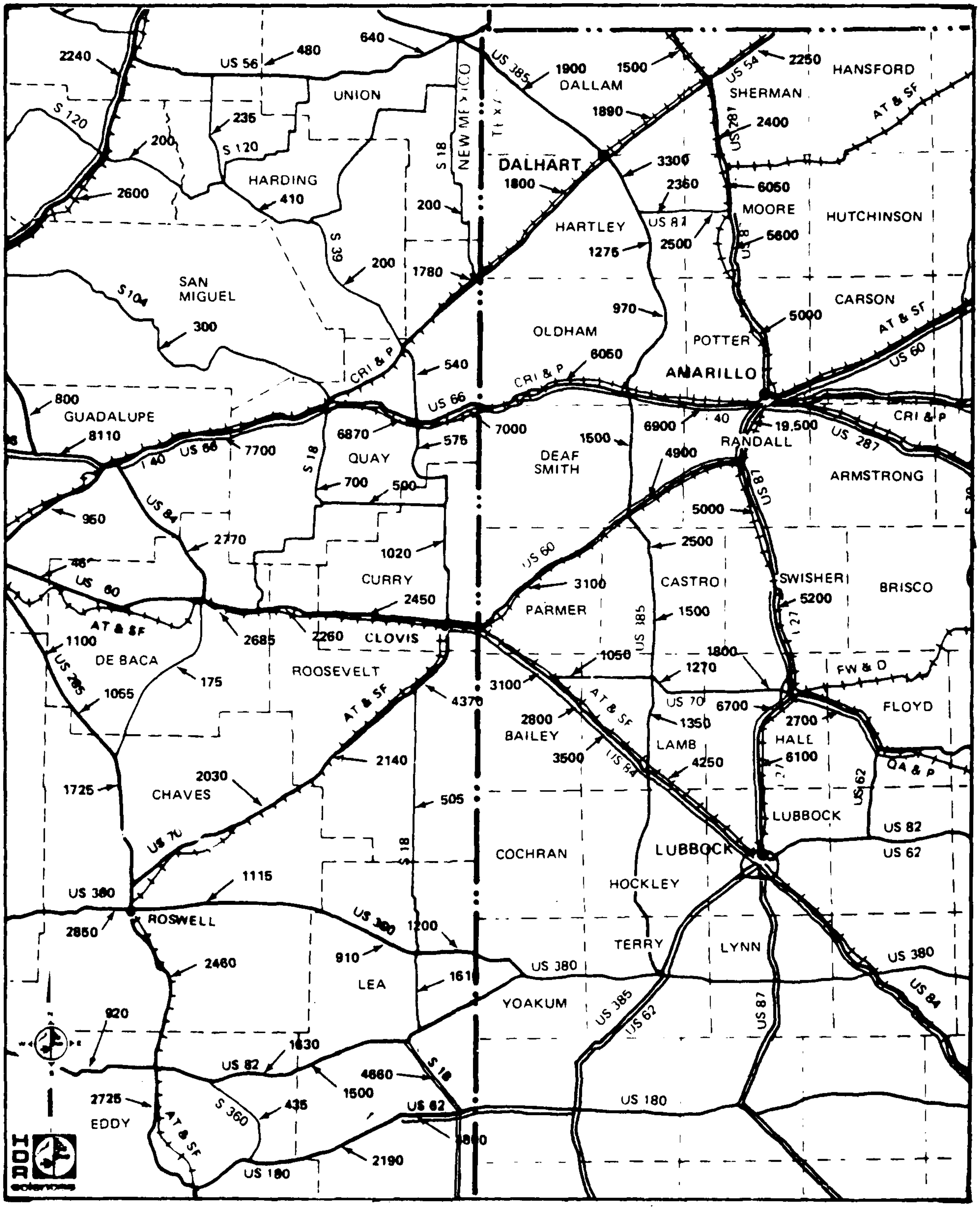

Figure 2-2. Existing road system and current traffic levels - Texas/New Mexico.

Table 2-3. Potential impacts on traffic in Texas/New Mexico for Alternative 7.

COUNTY	SHORT-TERM IMPACT[1]	LONG-TERM IMPACT[1]
Counties with M-X Clusters and DTN		
Bailey, TX[2]	Moderate	No
Castro, TX[2]	High	No
Cochran, TX[2]	Low	No
Dallam, TX[2]	High	High
Deaf Smith, TX[2,4]	High	No
Hartley, TX[3,4]	High	High
Hockley, TX	No	No
Lamb, TX	No	No
Oldham, TX	No	No
Parmer, TX[2]	Moderate	No
Randall, TX[2]	Moderate	No
Sherman, TX	No	No
Swisher, TX[2]	No	No
Chaves, NM[2]	Moderate	No
Curry, NM[3]	High	High
DeBaca, NM	Low	No
Guadalupe, NM	No	No
Harding, NM[2]	Moderate	No
Lea, NM	No	No
Quay, NM[2]	Moderate	No
Roosevelt, NM[2,4]	Moderate	Moderate
Union, NM	No	No

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[1] No impact. (No or insignifi- imcreases in traffic on existing roads.)

Low impact. (Some increases in traffic expected; however, no road improvements should be required.)

Moderate impact. (Increases in traffic likely to cause occassional delay or incon- venience to motorists. Minor road improvements may be required of critical locations).

High impact. (Increases in traffic expected which could generate requirements for sub- stantial road system improve- ments

[2] Construction camp in county.

[3] Operating base in county.

[4] Conceptual location of Area Support Centers (ASCs).

construction camps are operating. Some road improvements may be necessary to accommodate traffic.

The first operating base site near Clovis would be an expansion of an existing facility, Cannon AFB, therefore traffic patterns would remain basically the same although there would be an increase in volume. Some congestion may result along US 60 unless improvements are made, especially at some of the critical intersec tions. There may be some localized traffic problems within Clovis itself during peak periods when traffic destined for the base will concentrate on approaches to US 60. In order to relieve traffic along U.S. 60 near the base, it may be desirable to provide an access point directly from State Route 467.

In the vicinity of the second operating base near Dalhart, the increase in traffic could result in some problems in the nearby communities. Dalhart, Dumas, and Hartley could be adversely affected by operating base-induced traffic traveling in or through them. All three of the communities could experience localized traffic problems at one or more locations along the main streets depending upon where new housing units or associated commercial establishments are constructed.

The mitigation measures identified for the Proposed Action could also be implemented for this alternative.

ALTERNATIVE 8

This alternative involves placing half of the system in Nevada/Utah and half in Texas/New Mexico with one operating base in each. Consequently, the impacts in each region would be less extensive, although the concentrations of impact around the project facilities would be similar.

Only half as many roads would be constructed in each region, therefore the increase in accessibility would be proportionately less than discussed for the Proposed Action and Alternative 7. The impacts on traffic near the construction camps would be similar to the full basing alternatives but only about half as many camps would be required in each region. Table 2-4 summarizes the projected impacts on traffic for Alternative 8.

The impacts on traffic near the Coyote Spring Valley operating base site would be similar to those discussed for the Proposed Action and the impacts near the Clovis operating base site would be similar to those discussed for Alternative 7.

Table 2-4. Potential impacts on traffic in Texas/New Mexico for Alternative 8.

HYDROLOGIC SUBUNIT OR COUNTY		SHORT-TERM IMPACT[1]	LONG-TERM IMPACT[1]
NO.	NAME		
Subunits or Counties with M-X Clusters and DTN			
4	Snake	Moderate	No
5	Pine[2]	High	No
6	White	Low	No
7	Fish Springs	Low	No
46	Sevier Desert[2]	High	No
46A	Sevier Desert-Dry Lake[2,3]	High	No
54	Wah Wah[2]	High	No
155C	Little Smoky—Southern	Low	No
156	Hot Creek	Moderate	No
170	Penoyer	Moderate	No
171	Coal[2]	High	No
172	Garden	Low	No
173A	Railroad—Southern	High	No
173B	Railroad—Northern	Low	No
180	Cave[2]	Moderate	No
181	Dry Lake[2,3]	High	No
182	Delamar	Moderate	No
183	Lake[2]	High	No
184	Spring	Low	No
196	Hamlin	Moderate	No
202	Patterson	Low	No
207	White River	Moderate	No
Other Affected Subunits or Counties			
210	Coyote Spring	High	High
212	Las Vegas	Moderate	Moderate
216	Garnet	Moderate	Moderate
217	Hidden—North	Moderate	Moderate
218	California Wash	Moderate	Moderate
219	Muddy River Springs	High	High
220	Lower Moapa	Moderate	Moderate
	Bailey, TX	Low	No
	Cochran, TX	Low	No
	Dallam, TX[2]	Moderate	No
	Deaf Smith, TX[2]	Moderate	No
	Hartley, TX[2,3]	Moderate	No
	Hockley, TX	No	No
	Lamb, TX	No	No
	Oldham, TX	No	No
	Parmer, TX	No	No
	Chaves, NM[2]	Moderate	No
	Curry, NM	High	High
	DeBaca, NM	Low	No
	Guadalupe, NM	No	No
	Harding, NM[2]	Moderate	No
	Lea, NM	No	No
	Quay, NM	Moderate	No
	Roosevelt, NM[2,3]	Moderate	Moderate
	Union, NM	No	No

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[1] No impact. (No significant increases in traffic on existing roads.)

Low impact. (Some increase in traffic is expected; however, no road improvements should be required.)

Moderate impact. (Increases in traffic likely to cause occasional delay or inconvenience to motorists. Minor road improvements may be required at critical locations.)

High impact. (Major increases in traffic expected which could generate requirements for substantial road system improvements.

[2] Construction camp in county.

[3] Conceptual location of Area Support Centers (ASCs).

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3.0 BASELINE ENVIRONMENT

The existing transportation network in each of the study areas is described in this section. Existing road systems and traffic patterns in the Nevada/Utah and Texas/New Mexico regions are discussed. Also noted are communities within the study area and identification of any locations within those communities which currently experience congestion or are approaching it.

3.1 NEVADA/UTAH DEPLOYMENT AREA

The existing road system in the Nevada/Utah region comprises a network of federal, state and county highways. As shown in Figure 3.1-1, the immediate area is served by U.S. Highways 6, 50 and 93. Although not directly in the proposed deployment area, Interstate Routes 70, 80, and 15 provide an important means of access to the area. State highway segments include Utah routes 21, 56, and 257 and Nevada routes 2, 7, 25, 8A, 21, 38, 46, and 51.

The highways are primarily two-lane, paved roads with the exceptions of the interstate routes, which are four-lane, divided roadways, and Nevada routes 21 and 46, which are unpaved.

These roads vary from relatively smooth and level segments to segments with sharp curves and steep grades where dictated by topography. Fourteen locations with winding alignments and grades in excess of four percent have been identified and are shown on Figure 3.1-2. These locations are confined to mountain passes and are listed in Table 3.1-1 along with an indication of the length of the section, the maximum grade, and the horizontal alignment severity. As is indicated in the table, the majority of these segments are located along U.S. 50 between Austin, Nevada and Delta, Utah.

In general, the existing highways have sufficient capacity to accommodate current traffic volumes, and have additional excess capacity to allow for increases in traffic levels.

Current traffic volumes are shown for representative highway segments in Figure 3.1-3 and Table 3.1-2. These volumes vary on I-15 from 2,500 to 6,800 vehicles per day and on I-80, from 2,800 to nearly 4,000 vehicles per day. Other routes carry noticeably less traffic. Many of the U.S. routes have light traffic ranging from less than 250 vehicles per day on a segment of U.S. 6 near Tonopah to slightly over 1,000 vehicles per day on a portion of U.S. 95 in southern Nevada. Current traffic volumes on state highways in this region range from less than 10 vehicles per day on Nevada Routes 21 and 38 to approximately 600 vehicles per day on a segment of Utah Route 56.

The capacity of most sections of two-lane highways is relatively high with the ability to accommodate 7,000 to 10,000 vehicles per day (vpd). These calculations were arrived at through capacity analysis with assumptions for the amount of trucks in the traffic stream and certain peaking characteristics (Nevada Department of Transportation, 1979; Highway Capacity Manual, 1965).

In certain areas of the study region, particularly the mountain passes identified earlier, highway alignment is severely influenced by the topography thereby

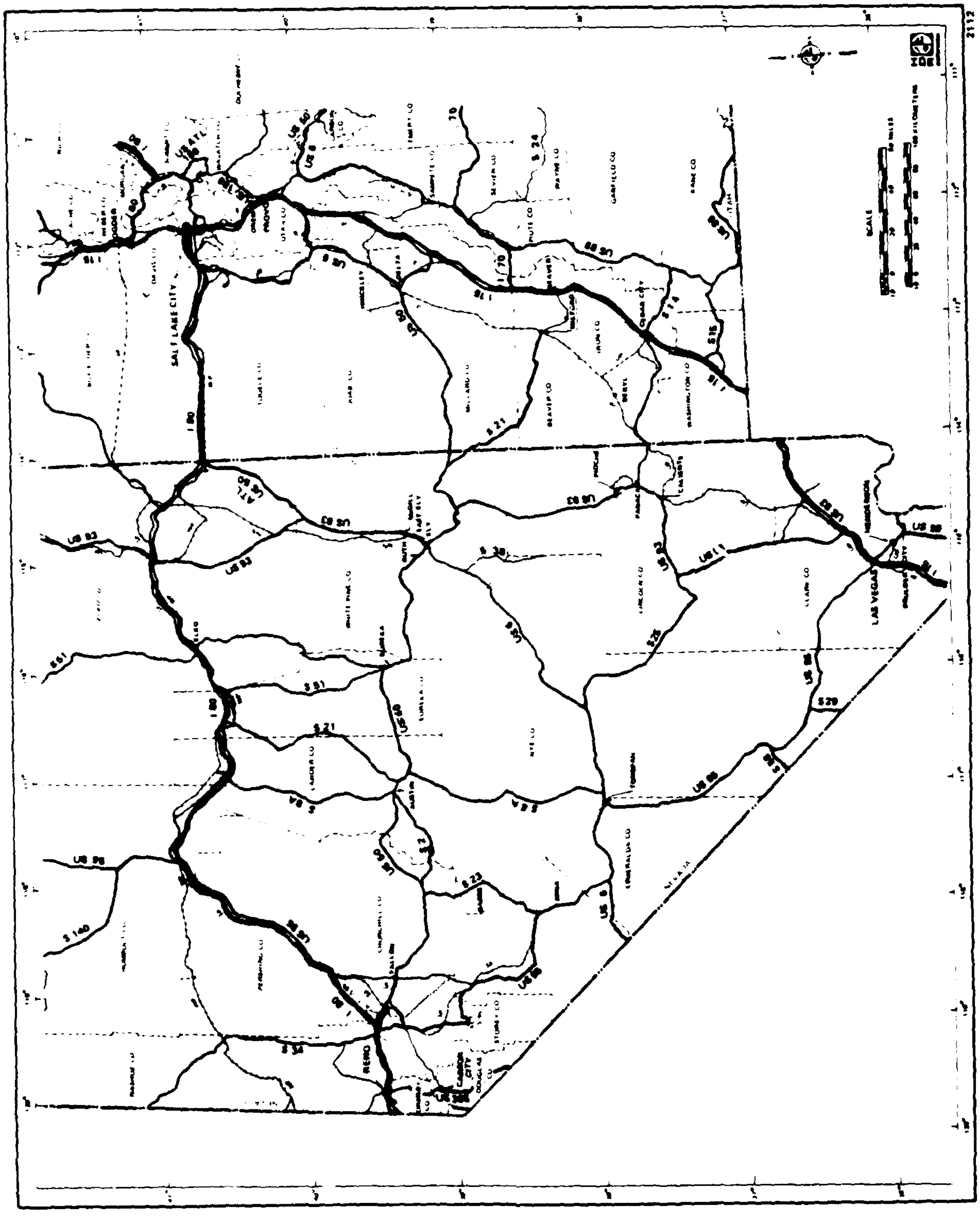

Figure 3.1-1. Existing road system - Nevada/Utah.

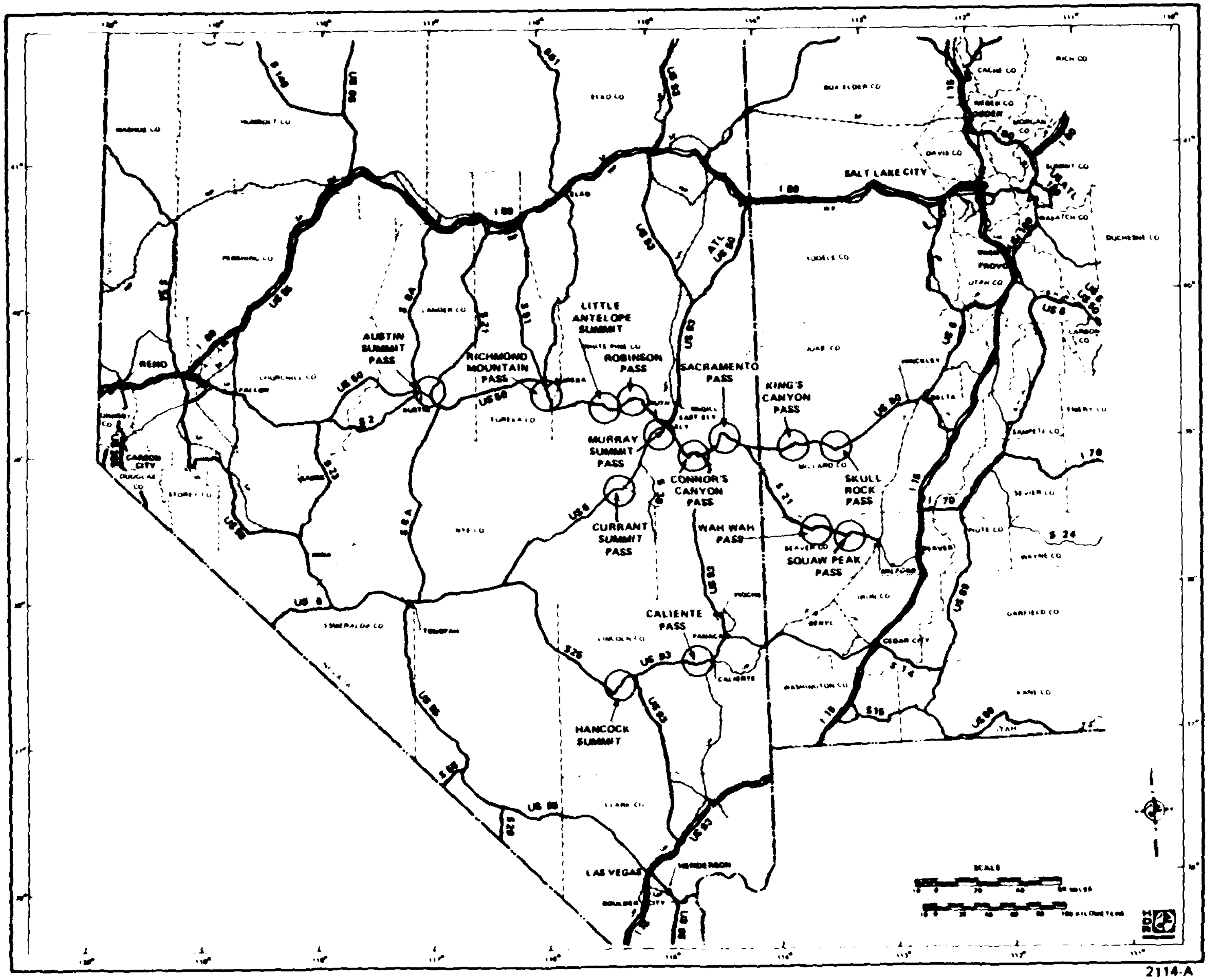

Figure 3.1-2. Difficult alignment locations - Nevada/Utah highways.

Table 3.1-1. Severe grades and alignment on existing highways in Nevada/Utah.

PASS	LOCATION	ROUTE	PERCENT OF MAXIMUM GRADE	LENGTH (miles)	ALIGNMENT	THEORETICAL CAPACITY (veh/hr)
Skull Rock	45 mi SW of Delta	U.S. 6 & 50	6.5+	1-1.5	Fair	220
Kings Canyon	55 mi SW of Delta	U.S. 6 & 50	5-7	7.5-8	Moderate to Poor	220
Sacramento	41-56 mi East of Ely	U.S. 6 & 50	5-7	3.5 mi	Moderate	200
Conners Canyon	18-27 mi East of Ely	U.S. 6 & 93	5-8	8.3	Moderate	330
Robinson	16-23 mi West of Ely	U.S. 50	3-4	7	Moderate	450
Little Antelope Summit	31-40 mi West of Ely	U.S. 50	4	9	Moderate to Poor	450
Richmond Mountain	Eureka to 13 mi East of Eureka	U.S. 50	4+	13	Moderate	420
Austin Summit	Austin to 12 mi East of Austin	U.S. 50	6-7	12	Poor	250
Squaw Peak	15-18 mi West of Milford	Utah 21	6+	0.5	Moderate	760
Wah Wah	30-35 mi West of Milford	Utah 21	7-7.5	1.5	Good	630
Caliente	Caliente to 15 mi West of Caliente	U.S. 93	6-7.5	1.5	Moderate	480
Hancock Summit	12 mi west of Crystal Springs	Nevada 25	6-7	2	Fair-Moderate	470
Currant Summit	5-15 mi NE of Currant Ranch	U.S. 6	6-7	1	Fair	200
Murray Summit	1-10 mi SW of Ely	U.S. 6	6	1	Poor	280

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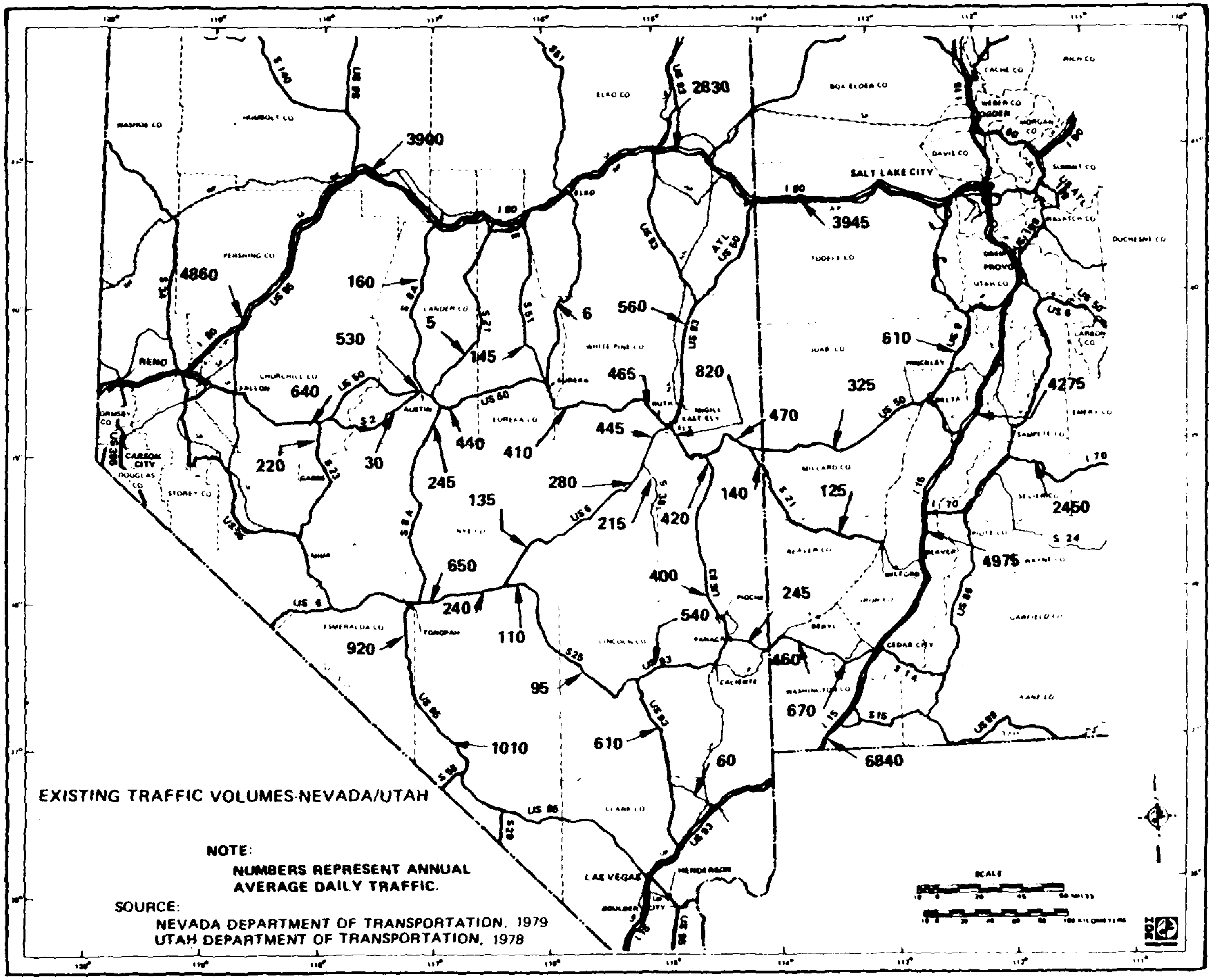

Figure 3.1-3. Existing traffic volumes - Nevada/Utah.

Table 3.1-2. Existing traffic volumes - Nevada/Utah.

STATE	ROUTE	SEGMENT	AVERAGE ADT (Vehicle/Day)
Nevada	I-80	U.S. 93 Junction to S 233 Junction	2,800
		East of U.S. 95 Junction	3,900
	U.S. 50	Utah Border to Fallon	540
	U.S. 6	Ely to Tonopah	350
	U.S. 93	I-15 Junction to Alternate 93 Junction	500
	U.S. 95	Las Vegas to U.S. 6 Junction	970
	S 7	U.S. 93 Junction to I-15 Junction	60
	S 8A	S 376 to I-80 Junction	200
	S 21	U.S. 50 Junction to I-80	5
	S 23	U.S. 95 Junction to U.S. 50 Junction	200
	S 25	Utah Border to U.S. 6 Junction	150
	S 38	South of U.S. 6 Junction	200
	S 46	U.S. 50 Junction to I-80	6
	S 51	U.S. 50 Junction to I-80	150
Utah	I-15	South of Cedar City	6,800
		Beaver to I-70 Junction	5,000
		U.S. 50 Junction to U.S. 6 Junction	4,300
	I-70	East of U.S. 89 Junction	2,500
	I-80	West of Salt Lake City	3,900
	U.S. 6	Eureka to Delta	600
		West of Delta	300
	S 21	West of Milford	100
	S 56	Modena to East of Newcastle	600

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limiting available capacity. In these cases, traffic operates at reduced levels of service, characterized by slow speeds and reduced passing opportunities. When coupled with relatively high levels of traffic, delay and congestion occasionally result primarily behind slow moving vehicles. The estimated theoretical capacities of these highway sections are shown in Table 3.1-1. These theoretical capacities reflect the effect of steep grades and winding alignment which reduce highway speed and corresponding affect capacity (Highway Capacity Manual, 1965). In general, most can sufficiently accommodate the existing traffic, although future increases may result in some congestion.

There are a number of small communities within the proposed deployment area. Those with populations over 500 are shown in Figure 3.1-4. Most of these communities are located on federal and state routes.

Of the communities identified, traffic data were available for Ely, Eureka, Caliente, Pioche, and Tonopah, and it is shown in Figure 3.1-5. The figures show that existing traffic through Eureka on U.S. 50 ranges from 1,000 to 1,500 vehicles per day, while in the Caliente-Pioche area, traffic on U.S. 93 varies from approximately 300 vehicles per day to 2,100 vehicles per day.

In Tonopah, a volume of over 7,000 vehicles per day was recorded on U.S. 6-95 near the center of town and in Ely the volumes on U.S. 50 are 9,000 to 10,000 vehicles per day. The highways through these communities are two-lane roadways with approximate capacities of 10,000 vehicles per day. Under current traffic loads, only Tonopah and Ely are near capacity.

In communities where traffic data were not readily available, examination of traffic data on nearby highway segments indicates the low likelihood of existing traffic problems in these communities.

In general, traffic data on the Nevada/Utah highway network and on streets within local communities indicate extremely light traffic for existing conditions. Only infrequent congestion is expected to be found on most highways or communities. However, certain highway segments with steep grades and sharp curves now function near capacity because of low operating speeds and reduced passing opportunities.

Population within the proposed deployment area is expected to increase by 35 to 53 percent by 1992 without the M-X project depending upon the size and amount of other major projects proposed for the area. Except for the immediate vicinity of those projects, the increase in traffic associated with the population increase should easily be accommodated by the existing road system.

3.2 TEXAS/NEW MEXICO DEPLOYMENT AREA

The Texas/New Mexico region is served by an extensive road network consisting of a well-developed system of federal and state highways and a highly defined grid of section-line county roads. The federal and state highway system is shown on Figure 3.2-1. East-west routes consist of I-40, I-25, U.S. 180, U.S. 82, U.S. 380, U.S. 60, U.S. 56, and U.S. 70. Service in a north-south direction is provided by U.S. 285, U.S. 287, U.S. 84, I-27-U.S. 87, and U.S. 385. State routes

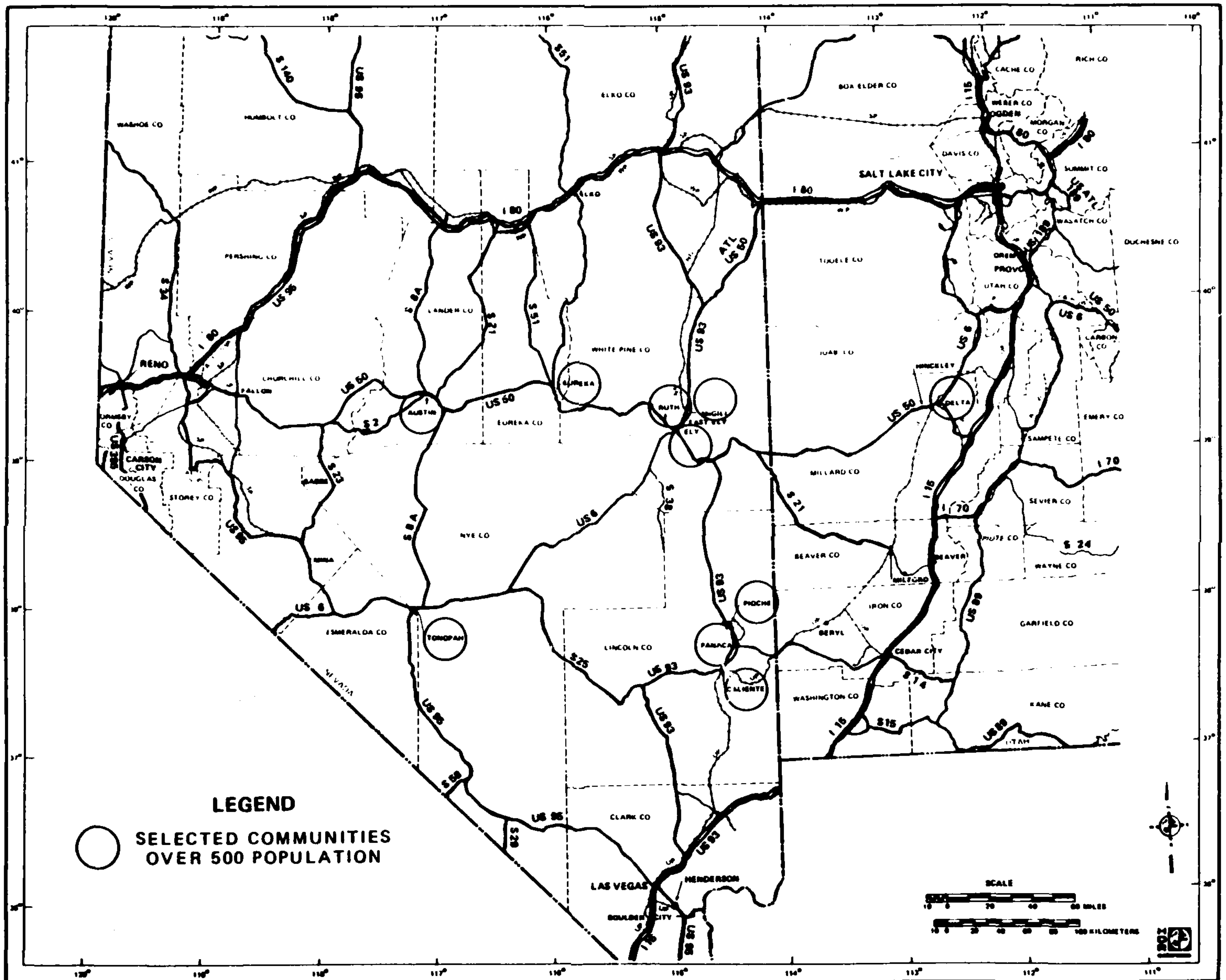

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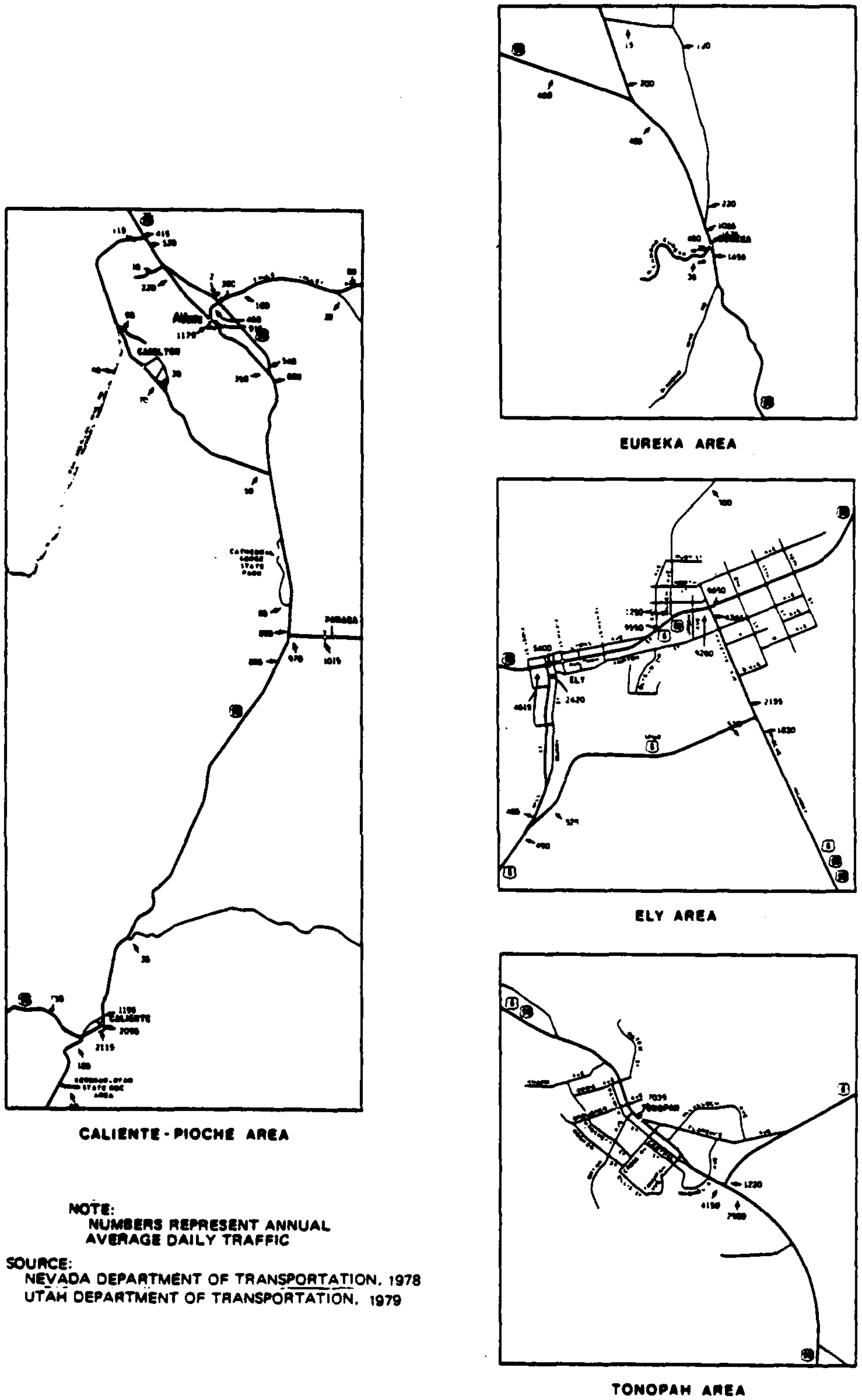
Figure 3.1-4. Communities with over 500 population - Nevada/Utah.



NOTE:
NUMBERS REPRESENT ANNUAL AVERAGE DAILY TRAFFIC

SOURCE:
NEVADA DEPARTMENT OF TRANSPORTATION, 1978
UTAH DEPARTMENT OF TRANSPORTATION, 1979

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Figure 3.1-5. Existing traffic volumes for Ely, Eureka, Caliente, Pioche, and Tonopah, Nevada.

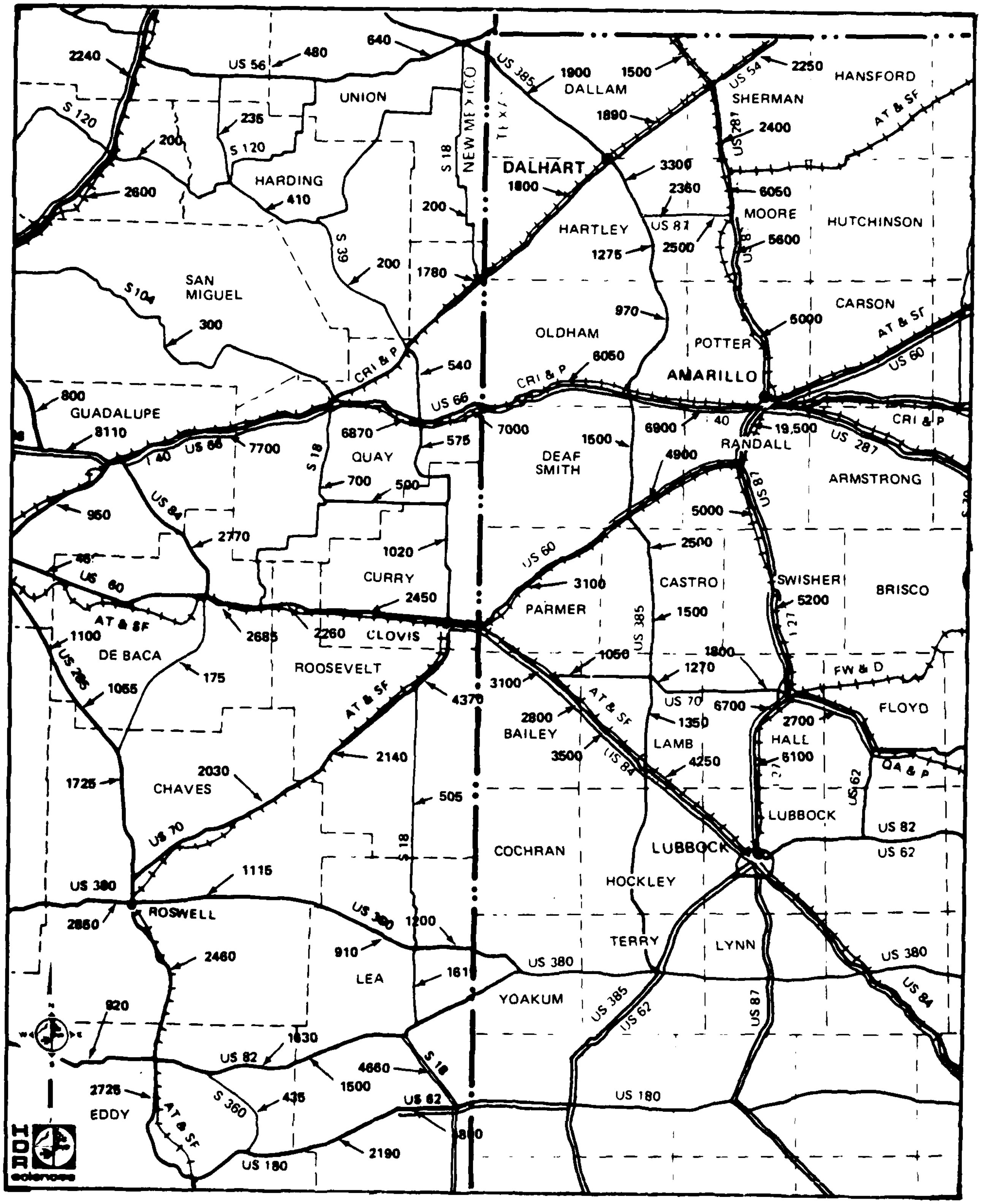


Figure 3.2-1. Existing traffic volumes - Texas/New Mexico.

which cross a significant portion of the region are New Mexico routes 18, 39, 104, and 120.

As in Nevada/Utah, much of the highway network is composed of two-lane roadways; however, a substantial part of the system is four-lane roadway. The four-lane network consists primarily of I-40 and I-27 (U.S. 87) with segments of U.S. 70, U.S. 60, U.S. 287, U.S. 62, U.S. 84, and New Mexico 18.

Unlike Nevada/Utah, the Texas/New Mexico region has few major topographic constraints t influence road alignment, and consequently the capacities of most highway segments in the region are generally unaffected by topography.

Traffic data were obtained from the Texas Department of Highways and Public Transportation and from the New Mexico Highway Department for highways within the region and it is shown in Figure 3.2-1 and summarized in Table 3.2-1. Traffic in this region is substantially higher than in Nevada/Utah. Average volumes on federal routes throughout the region vary from 560 to over 8,000 vehicles per day, and on state highways from 200 to 1,000 vehicles per day.

Highway sections were analyzed in order to determine existing problem areas. There are few locations where definite capacity problems exist, as nearly all of the traffic volumes are well within the capacity range of the existing roadway sections.

Selected Texas/New Mexico communities of over 500 population which lie in the M-X deployment area are shown in Figure 3.2-2. These communities are located on federal and state highways that cross the area. It should be noted that other communities within the area will also be affected, however these communities were selected as representative of locations where traffic impacts would be most evident.

In addition to Clovis and Dalhart, which are located near potential M-X operating base sites, the communities of Stratford, Hartley, Hereford, Dimmitt, Friona, Farwell, and Muleshoe in Texas, and Portales in New Mexico are located on major highways which directly serve the deployment area.

Current traffic data were not available for all communities within the study area, but traffic data were available for Dalhart, Hartley, Hereford, and Dimmitt. These data are shown on Figures 3.2-3 and 3.2-4. Existing volumes along U.S. 87 and along U.S. 54 in Dalhart range from 3,000 to 4,300 vehicles per day. These volumes are well within the capacity of the existing roadways. In Hartley, U.S. 87-385 carries 1,200 to 4,000 vehicles per day which is also easily serviced by the existing two-lane road.

Traffic volume on U.S. 385 through Dimmitt is significantly higher at 7,000 to 9,000 vehicles per day, which is near the capacity of the existing roadway. Hereford is serviced by a four-lane section of U.S. 60, which carries 5,000 to 9,000 vehicles per day. Traffic data on highway segments near the remaining communities indicate no apparent capacity problems within those communities.

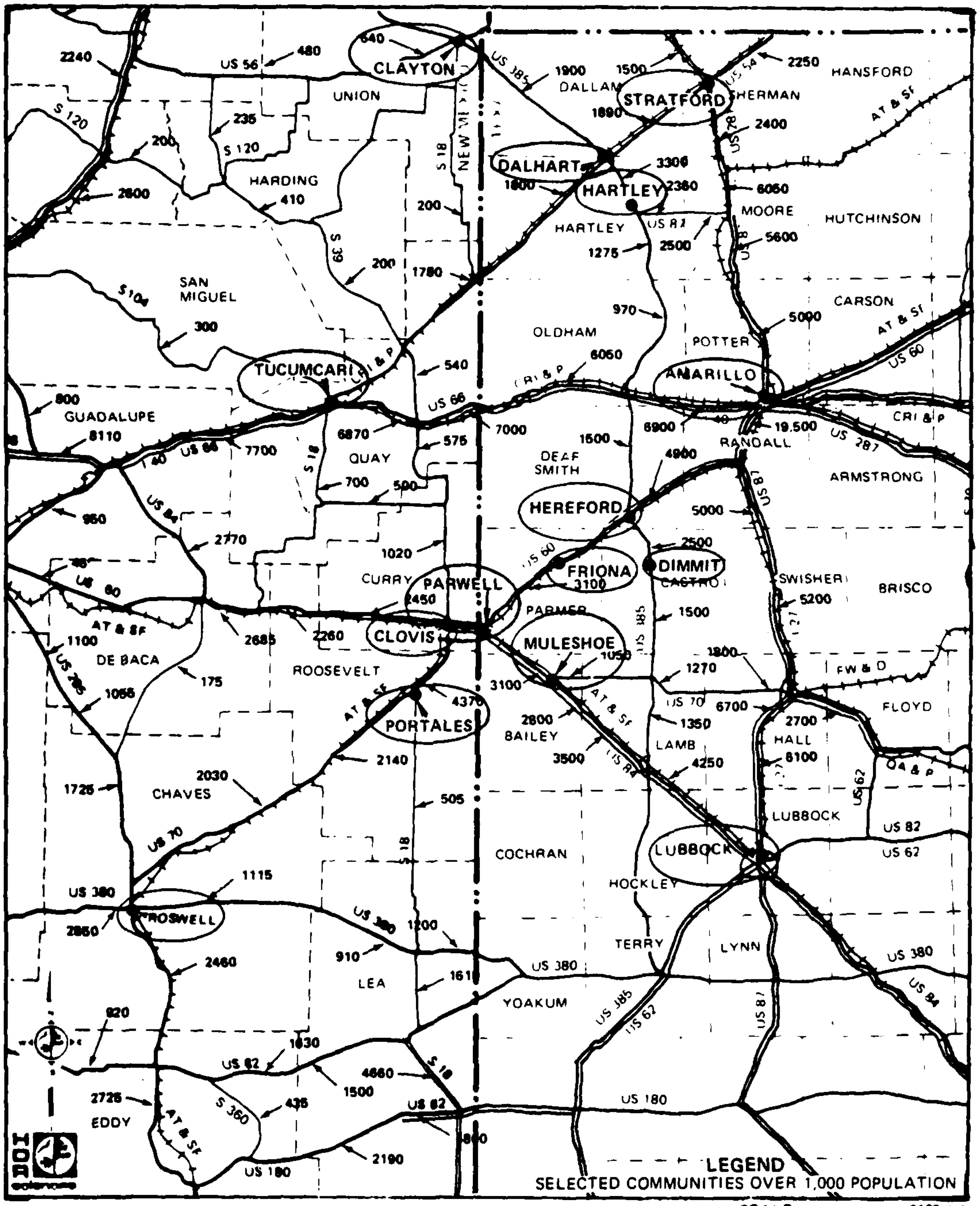
In general, the Texas/New Mexico road system has sufficient capacity to accommodate present and future needs. The street systems in local communities carry only light to moderate traffic. Moderate increases in traffic can be accommodated without roadway improvements in most of the areas studied.

Table 3.2-1. Existing traffic volumes - Texas/New Mexico

ROUTE	SEGMENT	AVERAGE ADT (Vehicle/Day)
I-25	Raton to Las Vegas	2,400
I-40	Amarillo to Tucumcari	6,600
	West of Tucumcari	7,600
U.S. 180	Hobbs to Carlsbad	2,500
U.S. 82	West of Artesia to New Mexico 18 Junction	1,400
U.S. 380	West of Roswell to Texas Border	1,500
U.S. 60	Ft. Sumner to U.S. 385 Junction	2,600
	Hereford to Canyon	5,000
U.S. 56	I-25 Junction to Hereford	560
U.S. 70	Muleshoe to Plainview	1,700
	Clovis to Portales	4,400
	New Mexico 18 Junction to U.S. 380 Junction	2,100
U.S. 84	Clovis to Lubbock	3,400
	Ft. Sumner to Santa Rosa	2,800
I-27-U.S. 87	Amarillo to Canyon	19,500
	Canyon to Plainview	5,100
	Plainview to Lubbock	6,400
U.S. 285	Roswell to Vaughn	1,300
	Carlsbad to Roswell	2,600
U.S. 287	North of Dumas	2,400
U.S. 385	North of Dalhart	2,000
	Dalhart to Hartley	3,300
	Hartley to E-40 Junction	1,100
	I-40 Junction to Littlefield	2,600
U.S. 54	Tucumcari to North of Stratford	1,800
NM 18	North of I-40	200
	I-40 to U.S. 380 Junction	800
	U.S. 380 Junction to Lovington	200
	Lovington to Hobbs	4,700
NM 39	U.S. 54 Junction to U.S. 56 Junction	300
NM 104	West of Tucumcari	300
NM 120	I-25 to U.S. 56 Junction	200

2653

Source: New Mexico Highway Department and Texas Highway Department.



NOTE:
NUMBERS REPRESENT ANNUAL AVERAGE DAILY TRAFFIC

SOURCE:
TEXAS STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION, 1975

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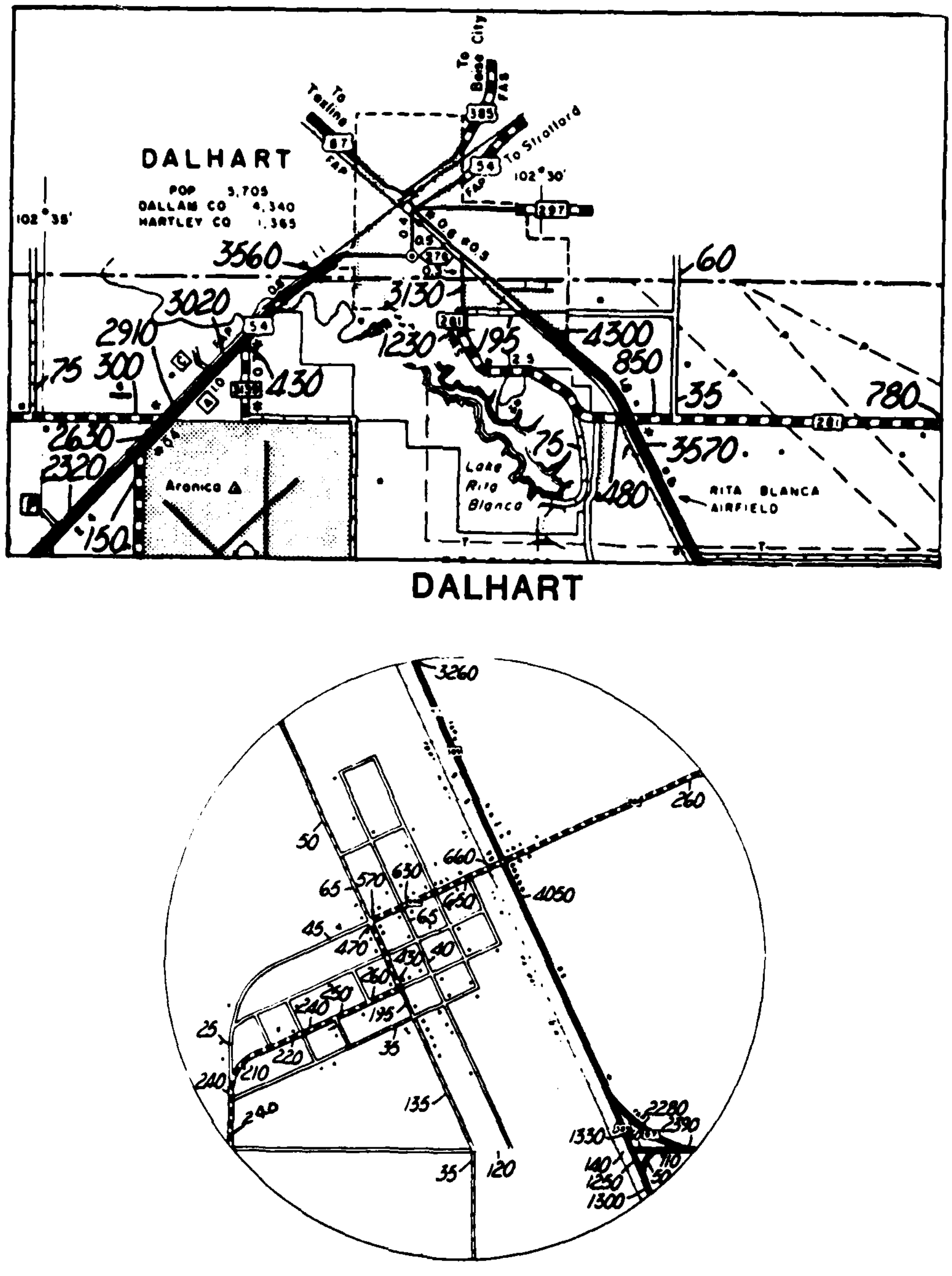
10 0 20 40 60 MILES

10 0 20 40 60 KILOMETERS

Figure 3.2-2. Communities over 500 population - Texas/New Mexico.



NOTE:
NUMBERS REPRESENT ANNUAL AVERAGE DAILY TRAFFIC

SOURCE:
TEXAS STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION, 1975

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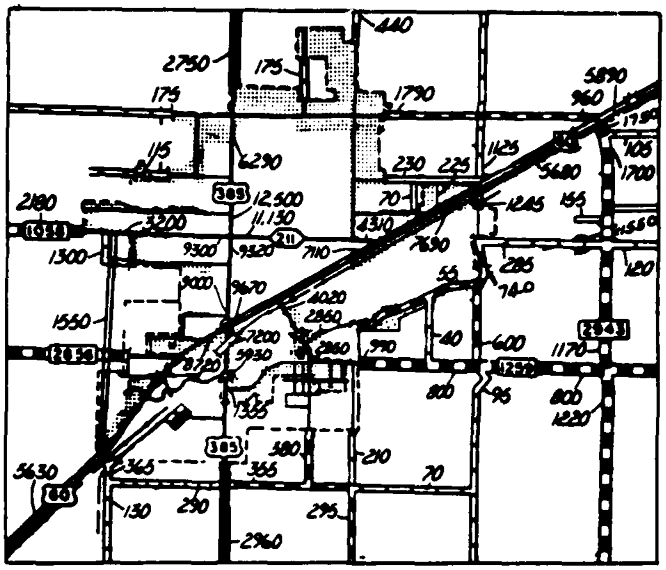
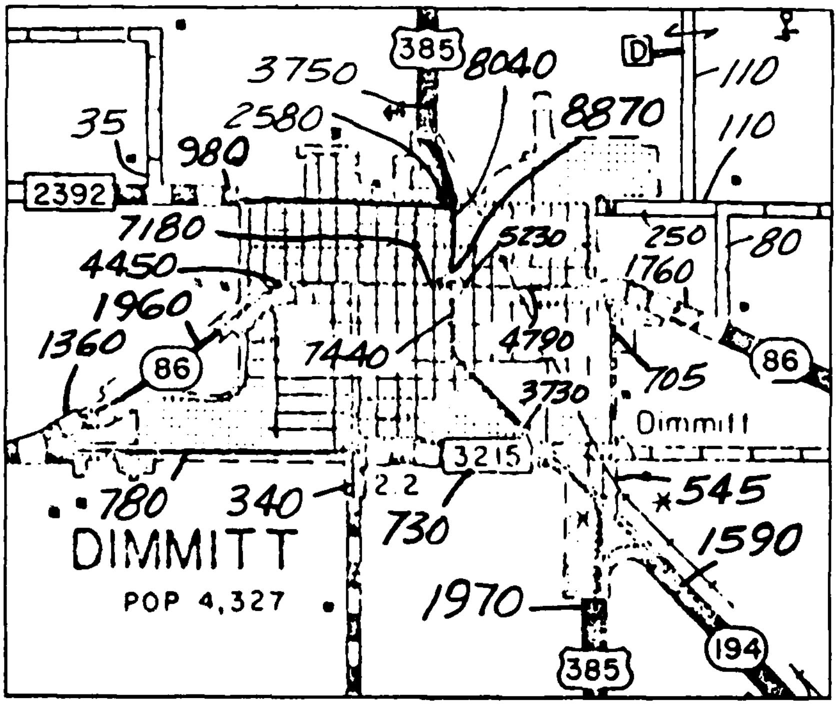
Figure 3.2-3. Existing traffic volumes for Dalhart and Hartley, Texas.



HEREFORD



DIMMITT

NOTE:
NUMBERS REPRESENT ANNUAL AVERAGE DAILY TRAFFIC

SOURCE:
TEXAS STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION, 1975

2124-A-1

Figure 3.2-4. Existing traffic volumes for Hereford and Dimmitt, Texas.

3.3 PROPOSED OPERATING BASE LOCATIONS

BERYL, UTAH (3.3.1)

The proposed base site at Beryl is in an undeveloped area in southern Utah. Primary access is via a 12-mile long paved road, which runs north from the intersection of State Highway 56. An unpaved road also passes through the area connecting Milford, approximately 50 mi to the northeast of Beryl, with Modena, 15 mi to the southeast of Beryl. A schematic map of the road network in the vicinity is shown in Figure 3.3.1-1.

The existing road between Beryl and Beryl Junction is a very low volume county road. No current traffic data were available. State Highway 56 is a good quality two-lane road with average daily traffic of 500 near Beryl Junction. The community of Cedar City is 43 mi to the east along this route. State Highway 18 is a good quality two-lane road, which passes through the community of St. George 60 mi to the south.

There are two small rural towns near Beryl Junction, Newcastle and Enterprise, which lie on State Highway 56 and 18, respectively. There are a number of small communities west of the proposed site along State Highway 56 that may attract some base employees. These include Pioche, Panaca, and Caliente. No major increases in traffic are anticipated in this vicinity without the M-X project.

COYOTE SPRING, NEVADA (3.3.2)

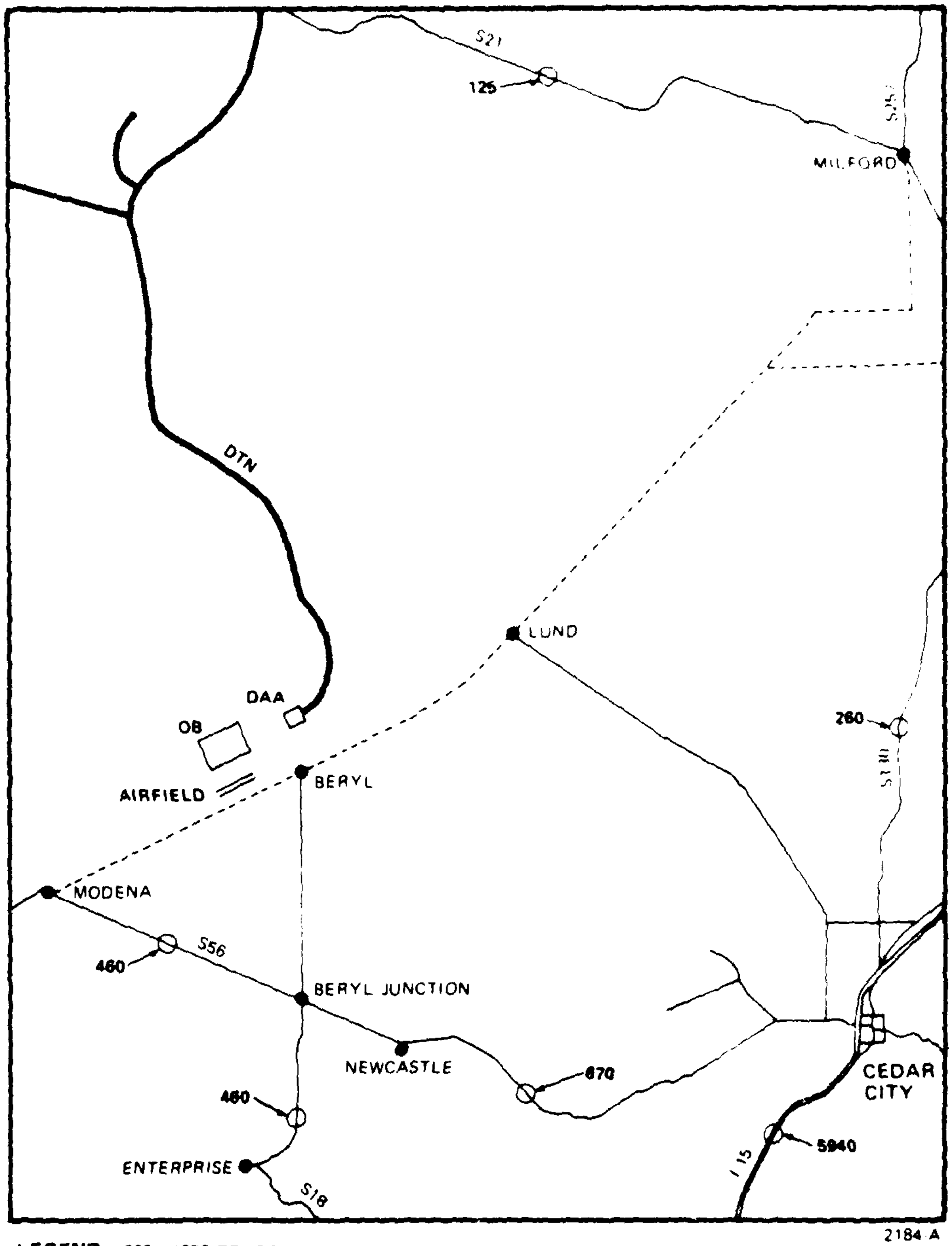
The proposed base site is 46 mi north of Las Vegas along U.S. Highway 93, which runs north and south through this area. this route provides the primary access to the vicinity of the proposed base. State Highway 7 runs southeast from the proposed site until it connects with Interstate 15 about 25 mi away, near the community of Moapa. Moapa is one of several small communities near the northern tip of Lake Mead. Figure 3.3.2-1 is a schematic map of the area showing principal roads.

U.S. 93 in this vicinity is a low volume road with an ADT of only 600 in 1978. About 10 mi north of Las Vegas it joins with Interstate 15, which has an ADT in this vicinity of 6,700. State Highway 7 has an ADT of less than 100 immediately southeast of its intersection with U.S. 93. Although the population of Clark County is expected to increase by around 50 percent, traffic levels are expected to remain very low near the proposed site unless the M-X project or some other major project is constructed in the vicinity.

DELTA, UTAH (3.3.3)

The proposed site is approximately 20 mi west of the community of Delta along U.S. Highway 50, which is the only major road near the site and must be relied on for access. Near the community of Delta a number of state and county roads crisscross the area. Figure 3.3.3-1 is a schematic map showing the proposed site, major roads in the area, and 1978 traffic volumes.

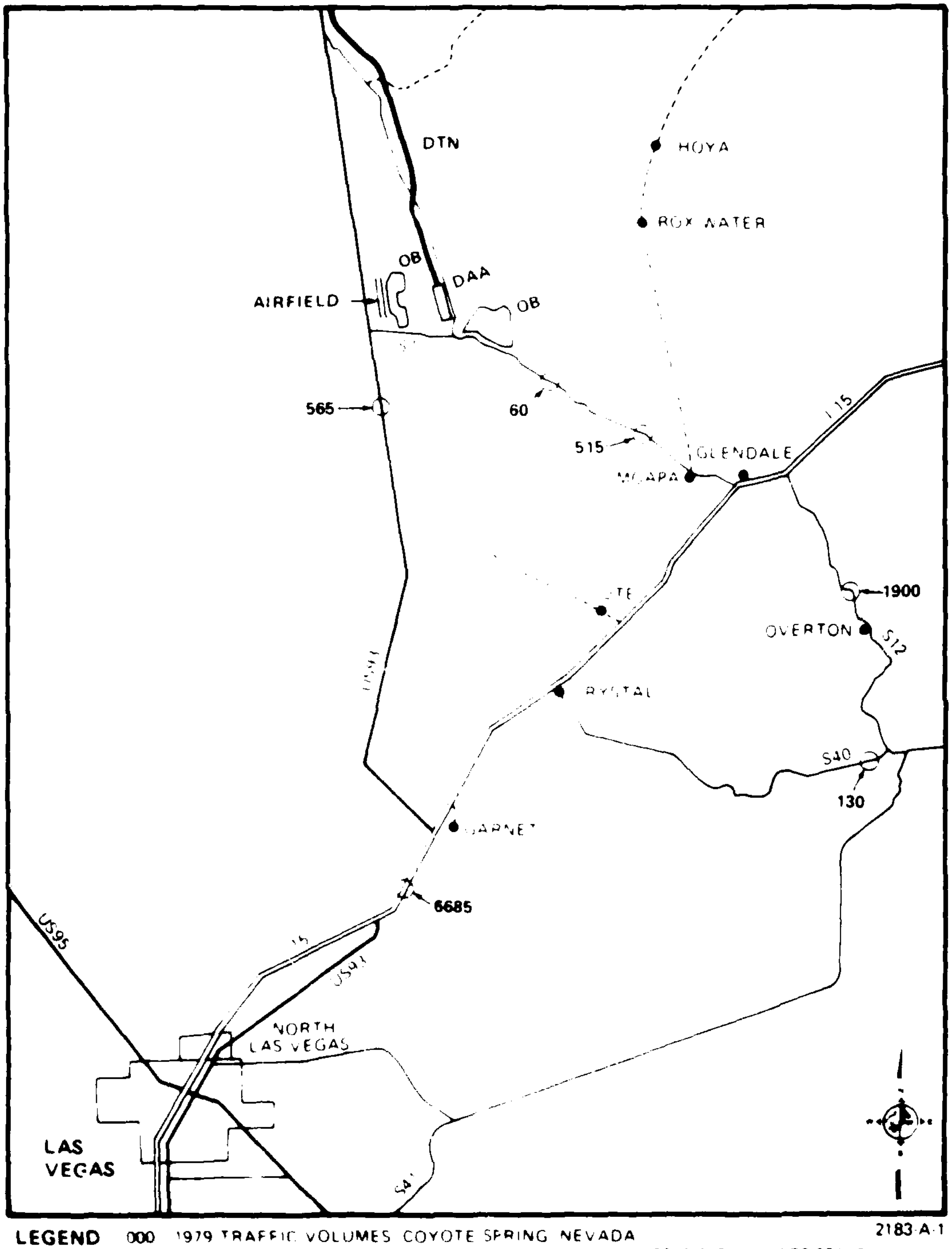
The 1978 ADT on U.S. 50 near the proposed site was 530 vehicles per day. Within the community of Delta, traffic along U.S. 50 is considerably higher.



LEGEND 000 - 1978 TRAFFIC VOLUMES; BERYL, UTAH

SOURCE: UTAH DEPARTMENT OF TRANSPORTATION

Figure 3.3.1-1. Existing road network and traffic volumes in the vicinity of Beryl, Utah.



LEGEND 000 1979 TRAFFIC VOLUMES COYOTE SPRING NEVADA

SCHEMATIC NOT TO SCALE

SOURCE NEVADA DEPARTMENT OF TRANSPORTATION

Figure 3.3.2-1. Existing road network and traffic volumes in the vicinity of Coyote Spring, Nevada.

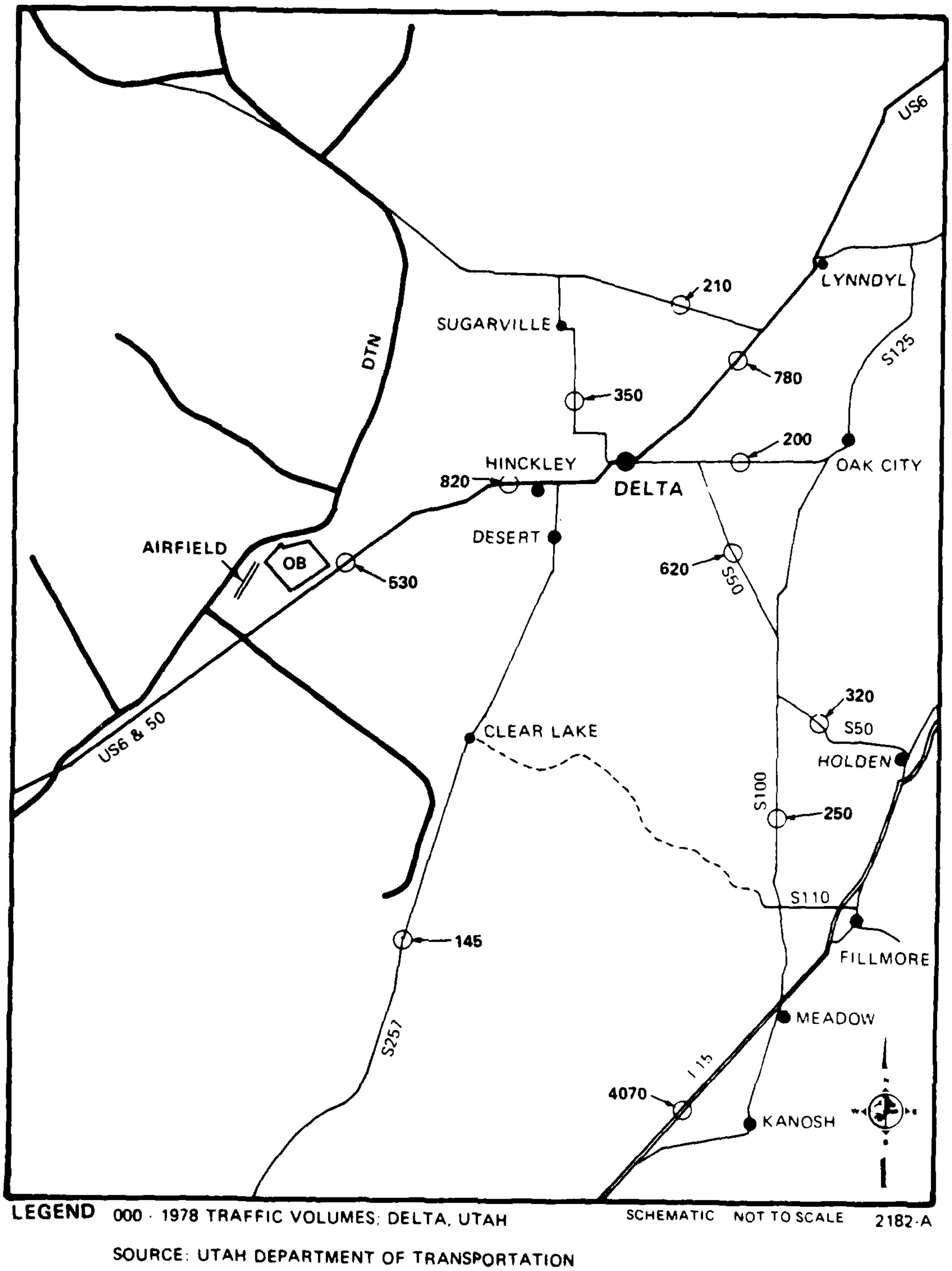


Figure 3.3.3-1. Existing road network and traffic volumes in the vicinity of Delta, Utah.

The proposed Intermountain Power Plant location is northwest of Delta near the community of Lynndyl. During construction of the plant, a large number of construction workers will move into the area. Traffic will undoubtedly increase in the entire area as a result, but it is not likely that traffic volumes will be significantly affected near the proposed base site itself. Traffic within Delta and other communities, especially to the northeast, will undoubtedly increase in the entire area as a result, but it is not likely that traffic volumes will be significantly affected near the proposed base site itself. Traffic within Delta and other communities, especially to the northeast, will undoubtedly increase.

Population projections for Millard County vary depending upon the amount of non-M-X-induced growth anticipated. By 1993 the population is anticipated to increase between 40 and 75 percent. Even a 75 percent increase in traffic on U.S. 50 between the proposed base site and Delta could easily be accommodated by the existing highway.

ELY, NEVADA (3.3.4)

The proposed base site is located 10 mi south of the city of Ely on the Pioche Highway (U.S. Highways 50 and 93). Major access to the vicinity of the proposed base will be along this route. U.S. 50 runs northwest from Ely past the town of Ruth, 8 mi away, and U.S. 93 runs north through the town of McGill, 12 mi away.

A schematic map of the existing network is shown on Figure 3.3.4-1. Also shown are the 1978 traffic volumes. The Pioche Highway between the proposed base site and Ely has an ADT of only 820 vehicles and unless some major industry moves into the area it is not expected to increase appreciably. White Pine County as a whole is expected to increase in population between 24 and 82 percent even without M-X. A corresponding increase in traffic along the Pioche Highway (even for the higher scenario) would mean an increase to only 1,500 vehicles per day, which is still very low.

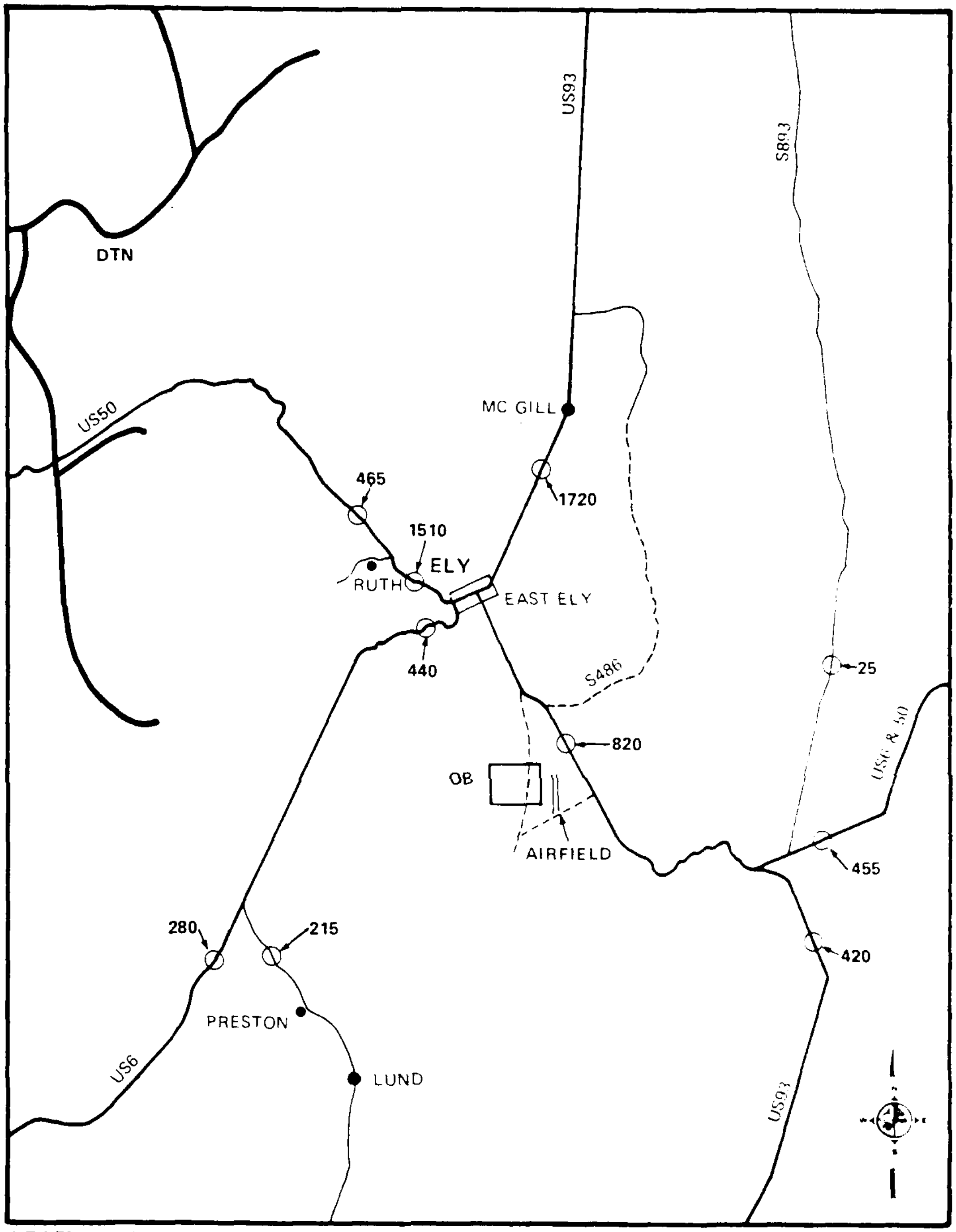
MILFORD, UTAH (3.3.5)

The proposed base site is located approximately 20 mi southwest of the community of Milford. Access to the proposed site is provided by unsurfaced roads from Milford and Minersville. The community of Milford is served by state routes 257 and 21 plus other minor county roads. A schematic map of the existing road system in the area is shown on Figure 3.3.5-1 as are 1978 traffic volumes. No major increases in traffic are anticipated in this area without the M-X project.

CLOVIS, NEW MEXICO (3.3.6)

The proposed site involves an expansion of an existing facility, Cannon AFB. It is located approximately 10 mi west of Clovis on U.S. Highway 60, which runs east and west through the area. This is the primary access route and carries the large majority of traffic to the existing base. State Route 467 extends south from near the base and provides access to Portales, 13 mi to the south. Figure 3.3.6-1 is a schematic map of the area showing the major roads in the vicinity.

U.S. Highway 60 is a four-lane road with average daily traffic of 12,990 vehicles in the vicinity of Cannon AFB. Traffic on this road is expected to remain



LEGEND 000 - 1979 TRAFFIC VOLUMES; ELY, NEVADA

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SCHEMATIC NOT TO SCALE

SOURCE: NEVADA DEPARTMENT OF TRANSPORTATION

Figure 3.3.4-1. Existing road network and traffic volumes in the vicinity of Ely, Nevada.

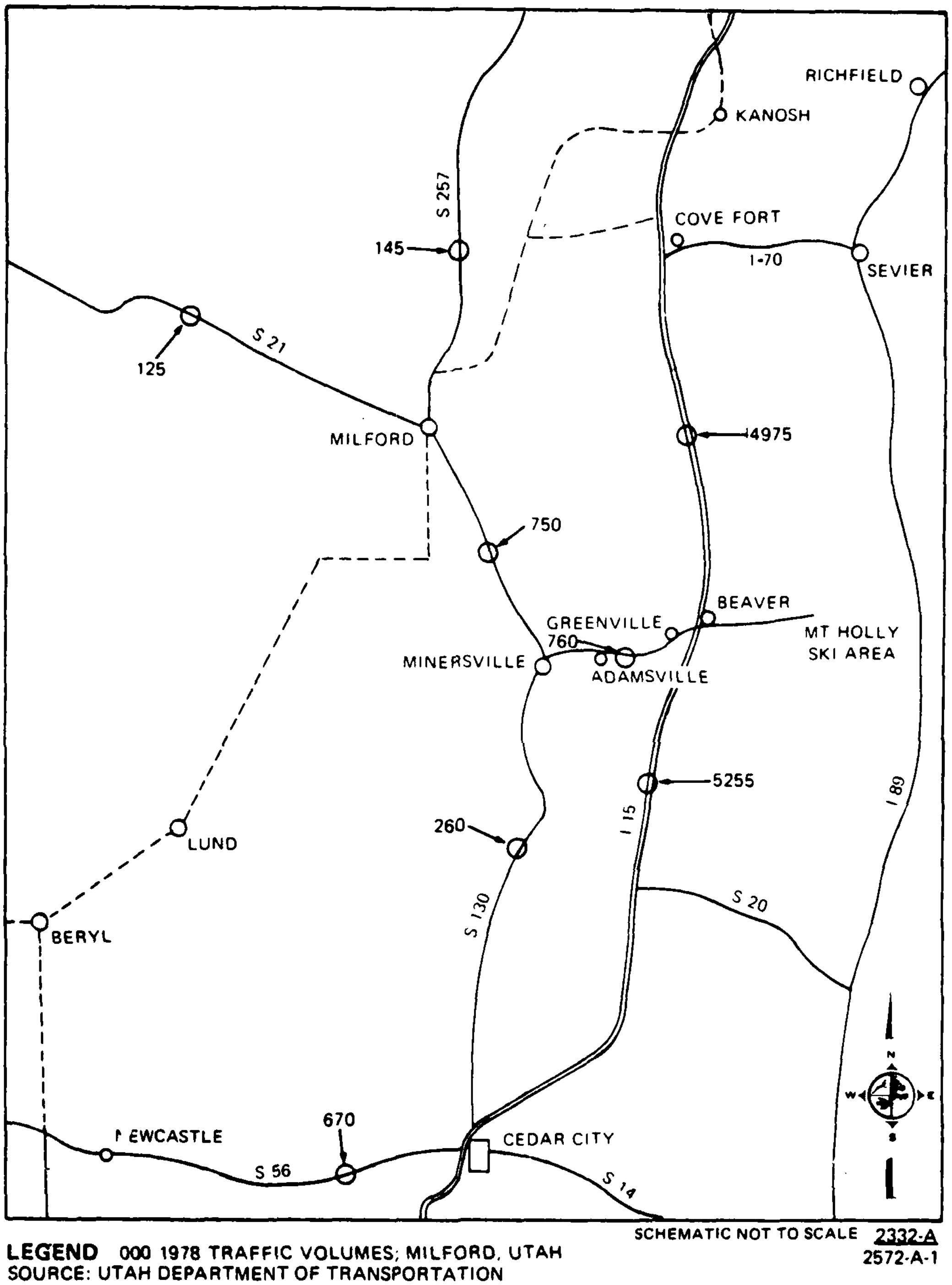


Figure 3.3.5-1. Existing road network and traffic volumes in the vicinity of Milford, Utah.

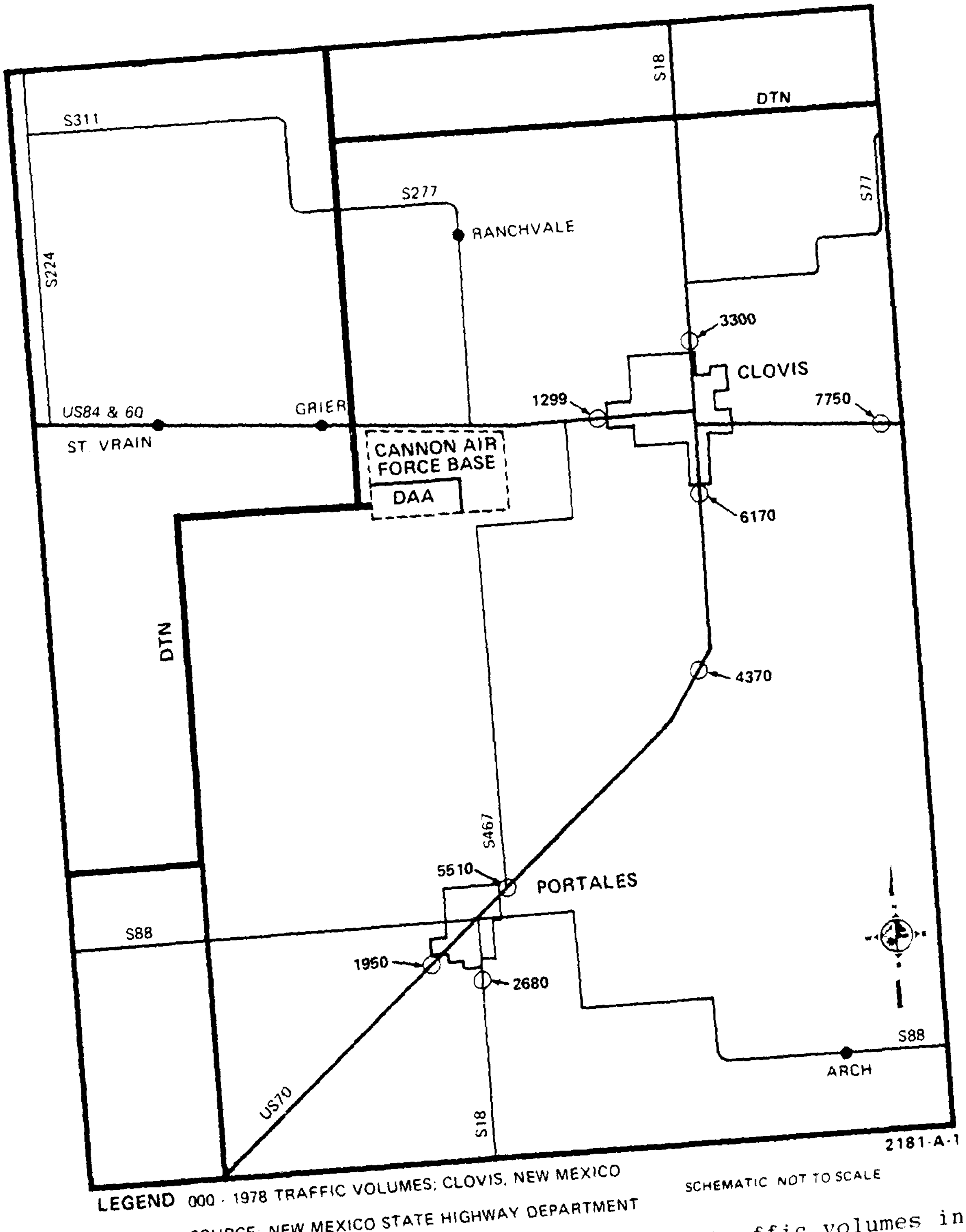


Figure 3.3.6-1. Existing road network and traffic volumes in the vicinity of Clovis, New Mexico.

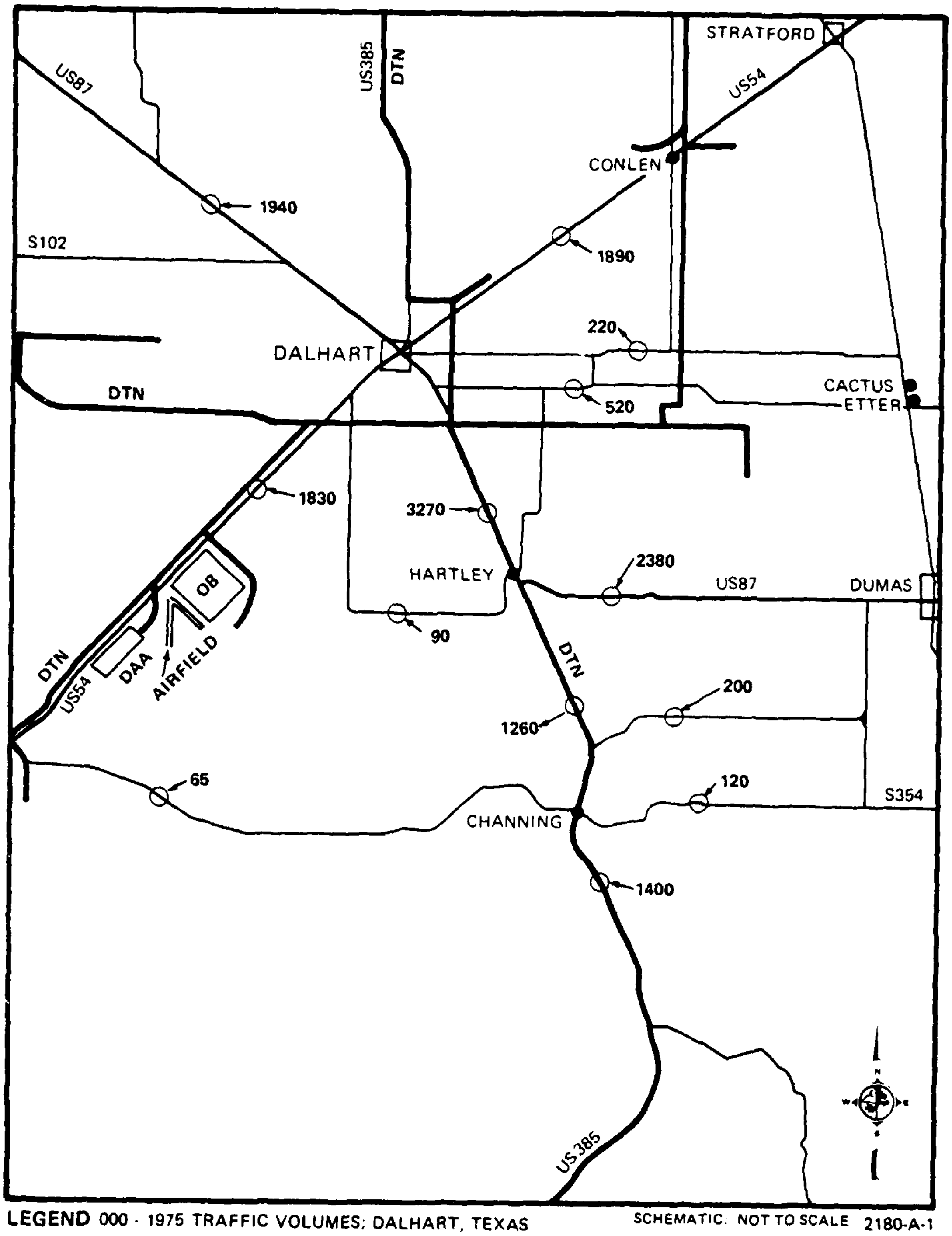
about the same without M-X-induced growth and the road should continue to provide a good level of service. State Route 467 is a low volume two-lane road currently classified as a secondary road. Traffic on this road is unlikely to increase appreciably without the M-X project since U.S. Highway 70 roughly parallels it to the east, and provides a much better route between Portales and Clovis.

DALHART, TEXAS (3.3.7)

The proposed base site is 10 mi southwest of the town of Dalhart. It lies along U.S. Highway 54, which is the only major route near the proposed site. U.S. Highway 385 runs north and south through Dalhart and provides access to Dumas, 48 mi to the east via U.S. Highway 87, and Amarillo, 100 mi to the southeast.

Figure 3.3.7-1 is a schematic map showing the major roads in the vicinity and 1975 traffic volumes. All of the existing roads in the area are good quality two-lane roads that presently operate at a good level of service. U.S. 54 has average daily traffic of 1,830 vehicles near the proposed site, and U.S. 385 has average daily traffic of 4,300 vehicles south of Dalhart.

There is an existing low-volume county road, running west from Hartley which passes near the proposed site. It is assumed that a connection would be made to the base from this road to provide better access to the site.



SOURCE: TEXAS STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION

Figure 3.3.7-1. Existing road network and traffic volumes in the vicinity of Dalhart, Texas.

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4.0 PROJECT EFFECTS AND ANALYSIS

4.1 NEVADA/UTAH DEPLOYMENT AREA

The road system in Nevada/Utah would be affected in two ways; it would be greatly expanded, almost 8,000 mi of new roads would be constructed, plus traffic upon it would increase substantially, especially during the construction phase.

Accessibility within the various hydrologic subunits varies greatly between very good to very poor. The impact of accessibility therefore can be measured in terms of the degree of improvement of the road system within each subunit. Increasing accessibility is significant for a number of reasons. It would provide a long term benefit to the area since all of the roads would be available for use by the public and many poor quality existing roads would be improved by the project. An expanded road system would also facilitate development in the region as well as use of the area for recreation. On the other hand, construction of the roads would disturb natural vegetation which would, in turn, effect wildlife due to removal of habitat. It would also increase the potential for damage to sensitive resources in formerly remote areas. The direct and indirect impacts on other resources associated with an increase in accessibility is discussed in the DEIS.

Within some of the hydrologic subunits, access is currently very poor, notably Coal, Gardin and Hamblin. In these subunits construction of the project would significantly improve the access and result in the corresponding impacts on other resources.

In most subunits, there are numerous roads, but most of them are of poor quality and not usable during poor weather except for off-road vehicles. Construction of the project roads would improve the quality of these roads since they would be maintained for all weather use. In those areas the impact on accessibility is considered to be moderate. In the remaining subunits, the existing road system is of better quality and the addition of project roads would only have a low impact on the accessability. Where only a small area of a subunit would have project roads within it, the impact is also considered to be low. Tables 2-1 and 2-2 list each of the subunits and the anticipated level of impact.

Increases in traffic on the existing roads would also cause a significant impact within the region. The majority of the impacts would occur during the construction phase. Most of the construction traffic itself would utilize the newly constructed DTN and/or cluster roads thus precluding, to a large degree, conflicts with traffic on existing highways. However, some conflicts would occur between construction traffic and current highway traffic at points where the DTN and cluster roads cross or coexist with existing roads (Table 4.1-1). While there would be a large number of these intersections, the actual effects on traffic due to construction traffic should be small since at all points where the DTN crosses an existing road that has average daily traffic over 500, including all federal and state routes, an overpass would be constructed. Moreover, cluster roads are specifically designed to avoid crossing or coexisting with any road that has average daily traffic over 250. At some of the locations there would be localized short-term delay to some motorists due to the crossing of construction vehicles. Localized improvements would be made where necessary to ensure safety and an orderly flow of traffic. These locations would be identified on a case-by-case basis and site-specific improvement would be made. This may include signing, signalization, or the temporary use of flagmen.

Table 4.1-1. Intersections between existing roads and railroads and proposed project roads - Nevada/Utah.

ALTERNATIVE	DEPLOYMENT[2]		DTN			CLUSTER ROADS[3]		INTERSECTIONS WITH RAILROADS DTN
	NEVADA	UTAH	FEDERAL OR STATE	PAVED	OTHER	PAVED	OTHER	
Proposed Action Alternatives 1-6	144	56	32	3	295	2	1,783	—
8	70	30	12	1	125	1	822	—

3014-3

[1]At all intersections with state and federal routes, county roads with average daily traffic over 500 vehicles per day and all railroad crossings, overpasses will be constructed.

[2]Number of missiles in each state.

[3]Cluster roads are specifically designed not to intersect with any road that has an average daily traffic over 250 vehicles per day.

Some inconveniences would also occur where project roads are constructed on the same alignment as existing roads and delays or detouring of motorists would be required. The interruptions would be short-term and not significant due to the very low volume of traffic on those roads.

The major adverse impacts due to the project would be caused by construction workers, both those commuting to the construction areas from neighboring communities and those that would reside at the construction camps. This traffic would generally use the existing roads. While the overall volume would be fairly low, it will be substantially greater than there is now and would tend to be concentrated during peak periods. Some inconvenience and delay would result, primarily at locations where capacity is severely restricted, such as at mountain passes. Table 4.1-2 lists the mountain passes where the theoretical capacity is expected to be exceeded unless mitigation measures are adopted. The theoretical capacity of two lane roads signals the maximum number of vehicles that can be accommodated without serious disruption to traffic flow. When the theoretical capacity is reached, or exceeded, as is probable in this case, the resultant traffic flow is characterized by queues of vehicles generally backed up behind slow moving trucks with little or no opportunity to pass. Possible measures to mitigate the impacts include the construction of truck climbing lanes on steep grades, staggered work shifts, and use of buses or carpools.

Other than at the critical mountain passes, the capacities of the existing roads should be able to accommodate the anticipated construction worker commute and recreation trips. Capacities of all of the roadways shown is at least 5,000 vehicles per day, well over the projected volumes.

The construction workers not living in the construction camps will make daily commute trips from neighboring communities. The anticipated commute trips along with current daily traffic volumes are shown on Figure 4.1-1 for the alternatives with the full system in Nevada/Utah. The numbers represent the largest amount of commute traffic that is expected for each segment of highway shown. The peak volumes will not all occur at the same time since each construction camp will only be in operation for two to three years.

All of the construction workers living at the construction camps are expected to make recreation trips during the course of the project. These will principally occur on weekends or during ships changes and not on a daily basis. Figures 4.1-2 through 4.1-5 show the anticipated recreation trips for the year 1985 through 1989, which are the years during which the greatest amount of construction activity occurs, for the alternatives with the full system in Nevada/Utah.

Construction traffic itself will primarily use the DTN and cluster roads. It will vary from year to year and from area to area throughout the construction camps along the DTN. The volume and timing will depend upon the size and scheduling of each camp operation. Figure 4.1-6 shows the peak day construction traffic at various locations along the DTN and the years in which it will occur, for the alternatives with the full system in Nevada/Utah.

For Alternative 8, which has only half of the system in Nevada/Utah, the total traffic generated by the project would be only about half. However, the concentrations of traffic around the construction camps would be just as heavy as for the full

Table 4.1-2. Projected traffic by construction personnel in mountain pass segments - Nevada/Utah.

SEGMENT	THEORETICAL ESTIMATED CAPACITY[1] (VEH/HR) PEAK HOUR	ESTIMATED PEAK HOUR EXISTING TRAFFIC (VEH/HR)	PROJECTED TRAFFIC VOLUMES			
			CONSTRUCTION PERSONNEL COMMUTE TRIPS (VEH/HR)	TOTAL EXISTING TRAFFIC + COMMUTE TRIPS (VEH/HR)	CONSTRUCTION PERSONNEL RECREATIONAL TRIPS (VEH/HR)	TOTAL EXISTING TRAFFIC + RECREATIONAL TRIPS[2] (VEH/HR) PEAK HOUR
Skull Rock Pass	220	65	285	350[3]	535	600[3]
Kings Canyon Pass	220	65	285	350[3]	535	600[3]
Sacramento Pass	200	95	—	95	385	480[3]
Conners Pass	330	160	—	160	675	835[3]
Robinson Pass	450	95	225	320	235	330
Little Antelope	450	95	225	320	235	330
Richmond Mountain	420	80	190	270	230	250
Austin Summit	250	110	—	110	140	230
Squaw Peak	760	25	225	250	175	200
Wah Wah	630	25	225	250	175	200
Caliente	480	150	—	150	370	520[3]
Hancock Summit	470	20	—	20	240	260
Currant Summit	200	25	35	60	145	170
Murray Summit	280	90	—	90	420	510[3]

2740

[1]Theoretical capacity is based upon length of grade, width of lanes plus shoulders, and the estimated percentage of trucks.

[2]These traffic volumes are expected to occur only twice a week at most during the peak periods of construction camp activity.

[3]Exceeds theoretical capacity.

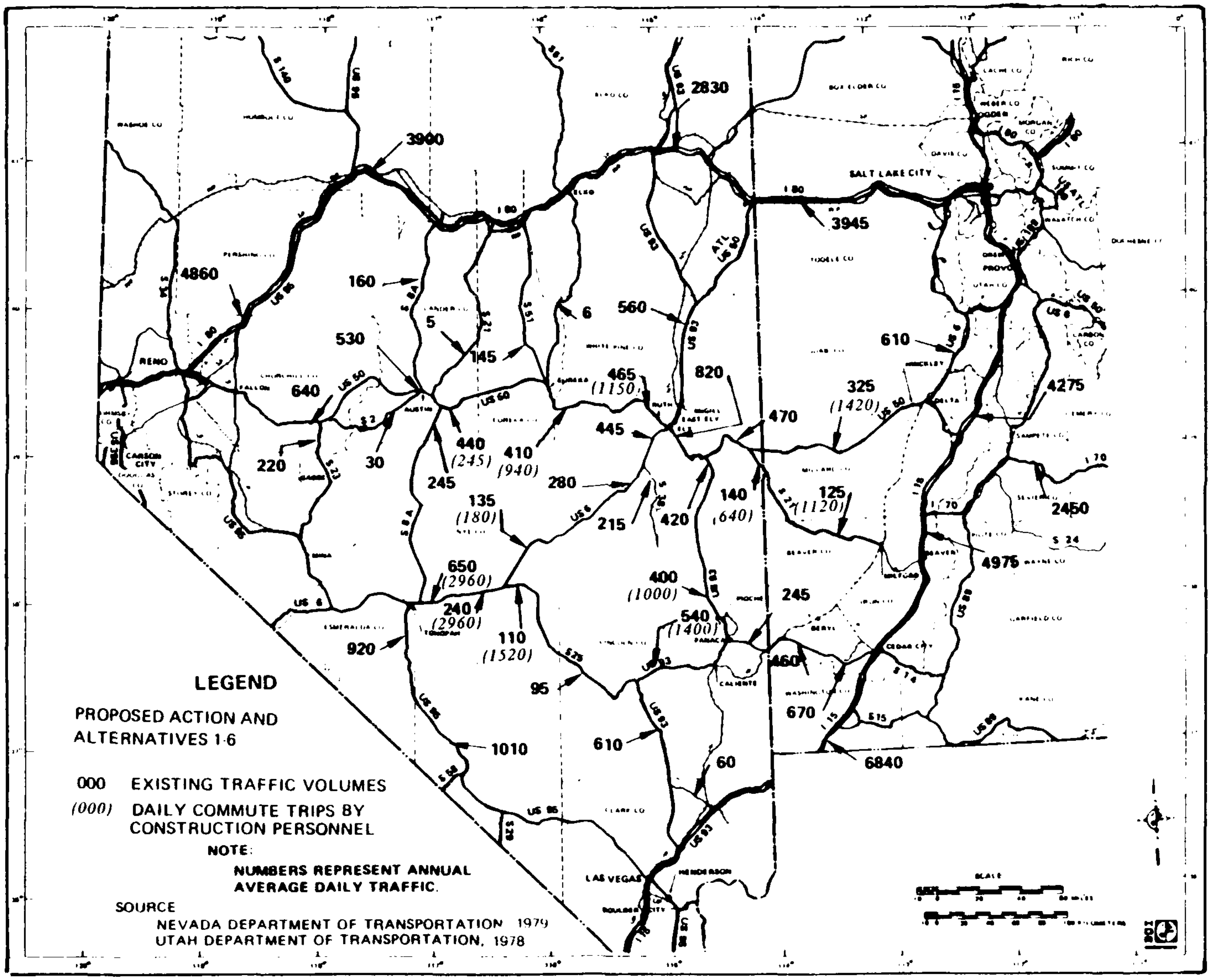

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Figure 4.1-1. Projected daily commute trips by construction personnel - Nevada/Utah.

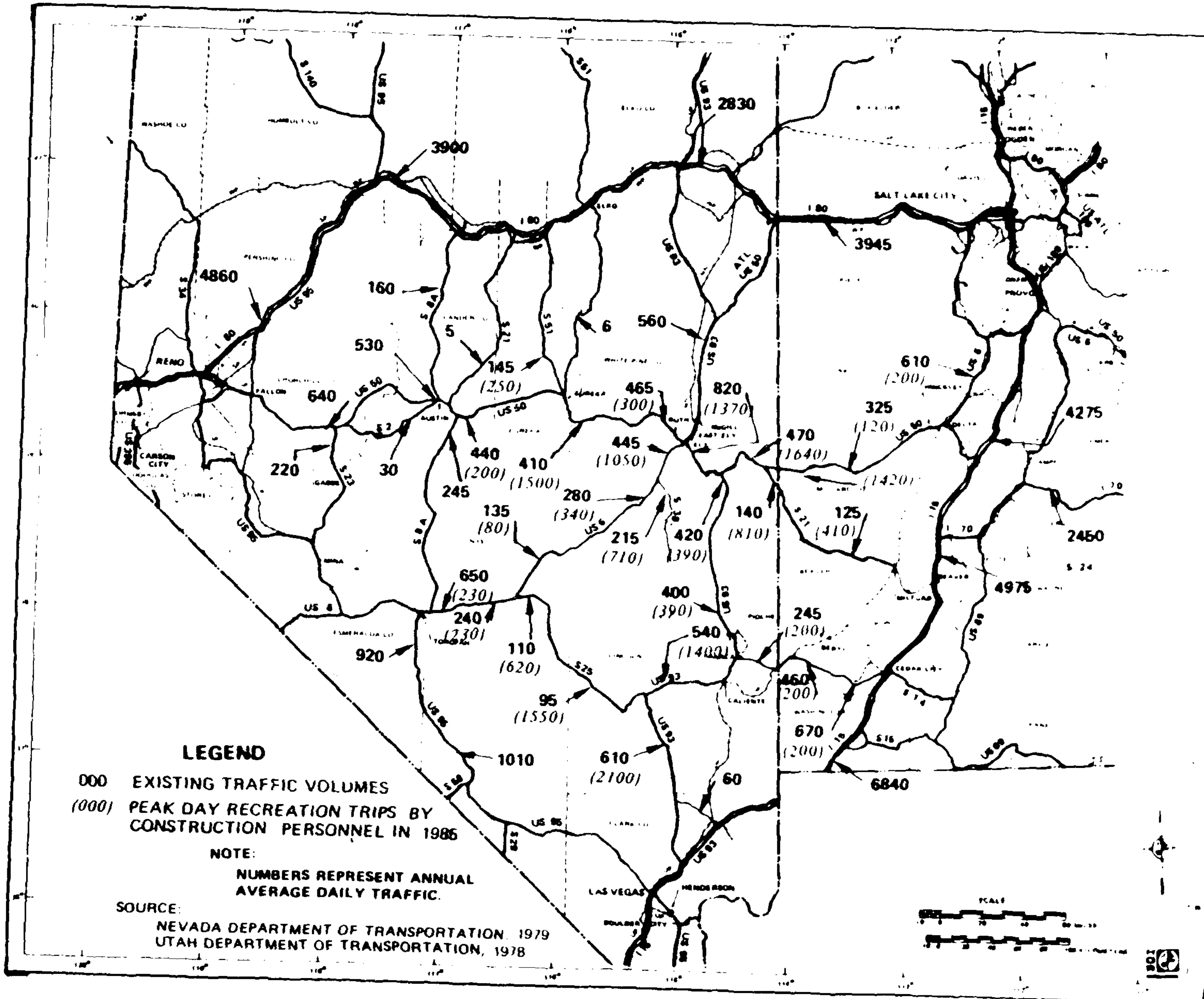

Figure 4.1-2. Projected peak day recreation trips by construction personnel in 1985 - Nevada/Utah.

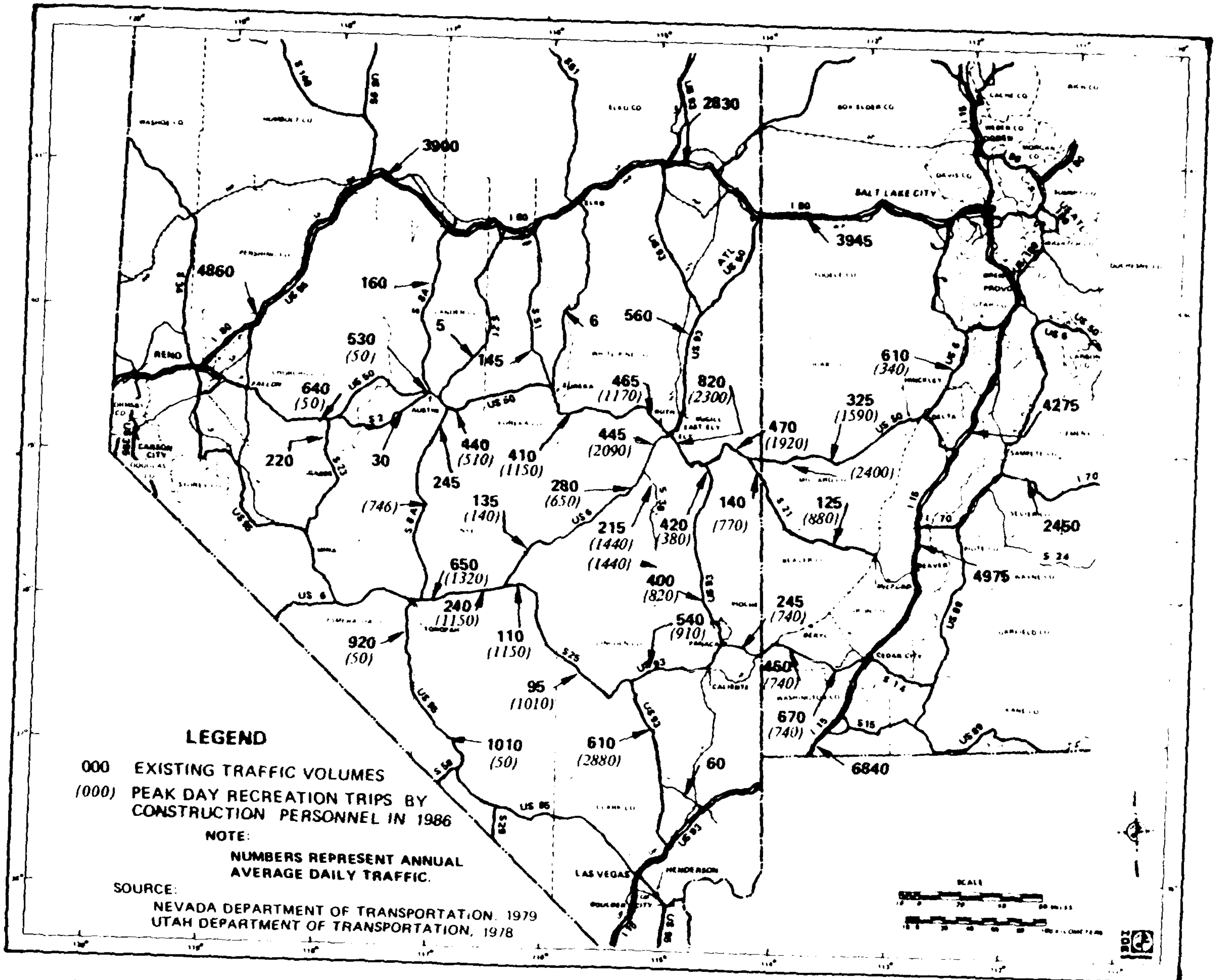

Figure 4.1-3. Projected peak day recreation trips by construction personnel in 1986 - Nevada/Utah.

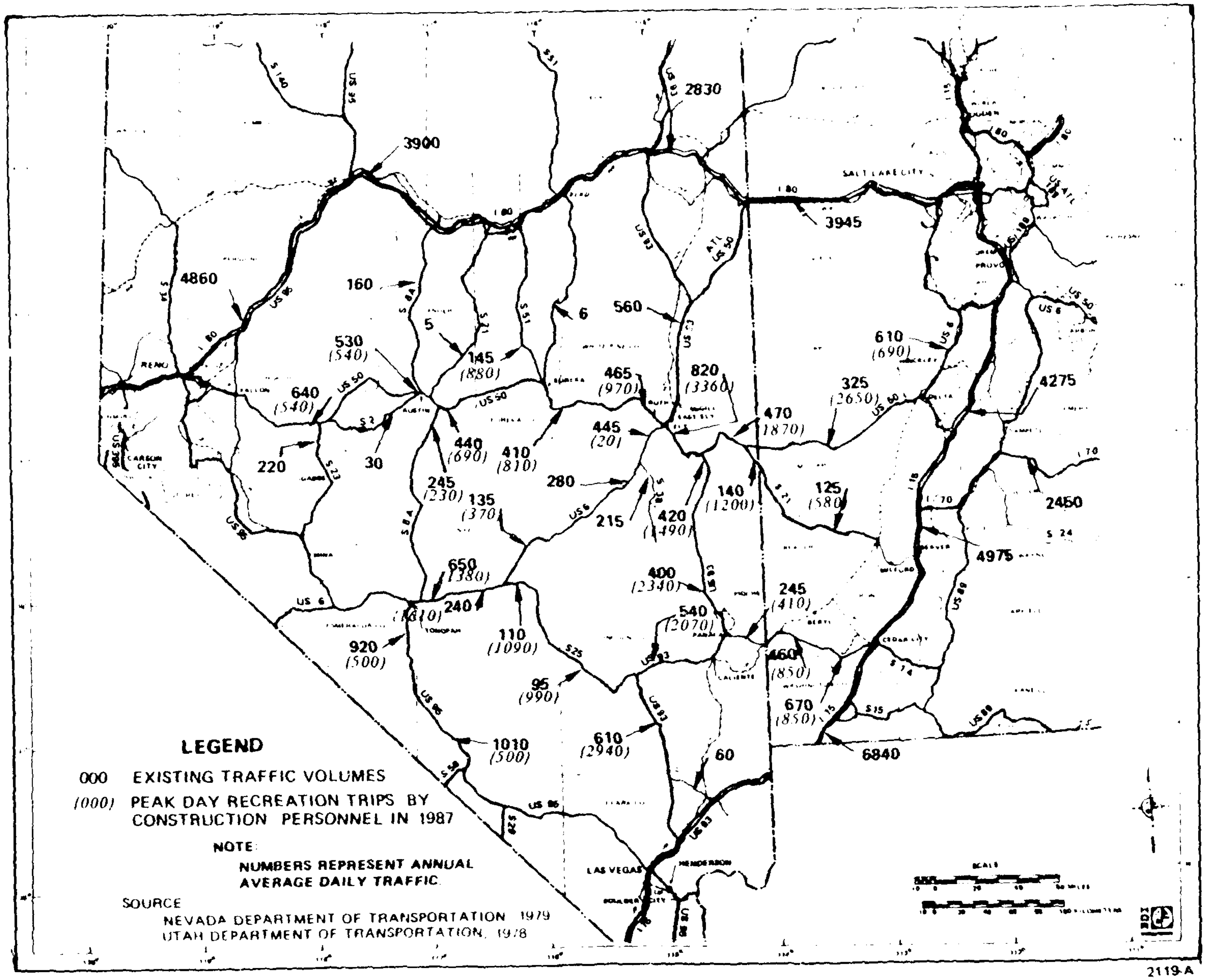

Figure 4.1-1. Projected peak day recreation trips by construction personnel in 1987 - Nevada/Utah.

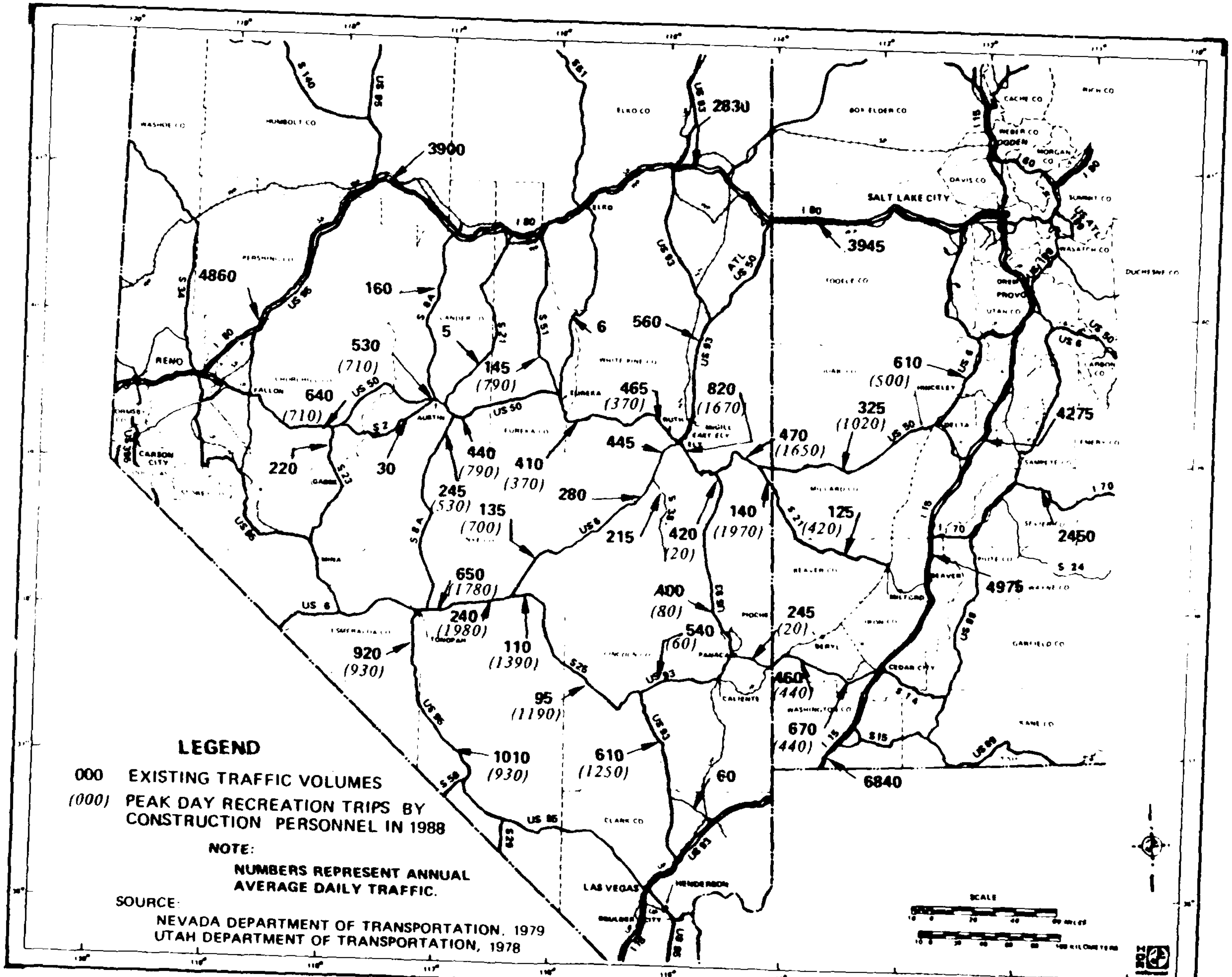

Figure 4.1-5. Projected peak day recreation trips by construction personnel in 1988 - Nevada/Utah.

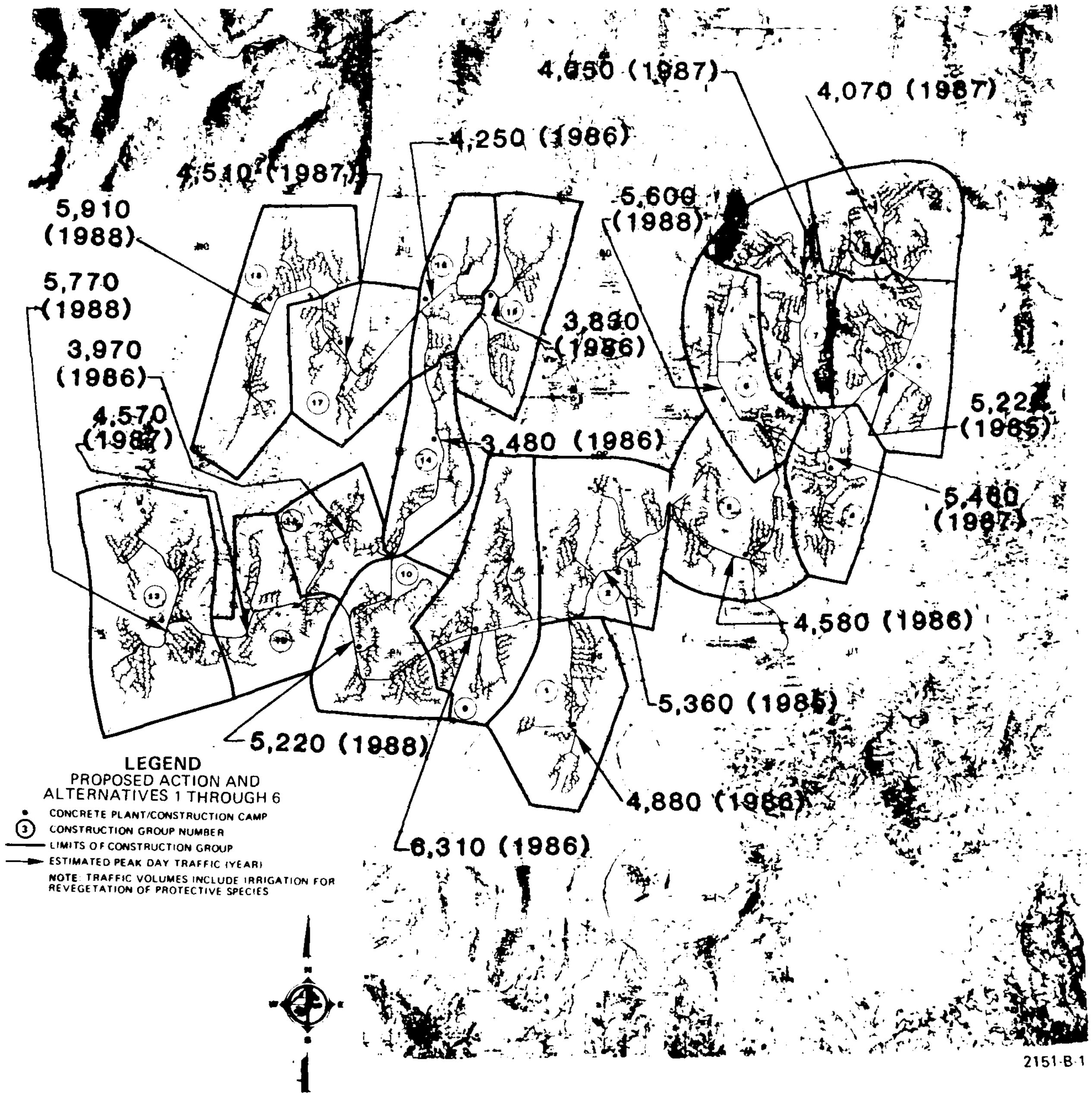

Figure 4.1-6. Peak day construction traffic - Nevada/Utah full.

basing alternatives. Figure 4.1-7 shows the anticipated commute trips and current daily traffic volumes for Alternative 8. Figures 4.1-8 through 4.1-11 show the anticipated recreation trips for the years 1985 through 1988. Figure 4.1-12 shows the anticipated construction traffic along the DTN and the year in which it will occur.

Communities near M-X construction camps would also receive increased traffic. The two communities expected to be affected the most are Tonopah and Ely. While nearby facilities are under construction both would have large increases in traffic that would likely cause congestion during some periods unless improvements are made, such as widening or installation of traffic signals. The other communities in the area would be affected, but not to the same degree, however, localized traffic problems may occur.

Some missile components would be constructed in California and Utah and shipped to the bases over existing roads in vehicles that will exceed current weight and size limits. Permits to ship these components will be required. Shipping oversize loads is common practice and the permitting process ensures that oversize loads are handled in a manner that does not damage the roadways, present safety problems, or significantly disrupt the normal flow of traffic.

The increase in traffic on the existing road system would likely increase the maintenance requirements. This would be especially true during the construction phase when supply trucks would be using the existing roads. The amount of additional maintenance required would vary for each segment of road and would depend upon such factors as the quality of the existing road, the number of heavy trucks that would use the road, and current maintenance practices.

During the operations phase the volume of traffic that would use the existing road system would be very small, averaging only a few vehicles per day. The movement of missile components would be confined to the DTN which would not affect traffic on the existing roads.

4.2 TEXAS/NEW MEXICO DEPLOYMENT AREA

The major impact on the road system within the Texas/New Mexico region would result from the increases in existing traffic levels. However, the existing road system is extensive and provides good access to most areas, the construction of project roads would not significantly increase accessibility within the region.

The major impacts on the existing road system would occur during the construction phase. Most of the construction traffic itself will utilize the newly constructed DTN and/or cluster roads thus precluding, to a large degree, conflicts with traffic on existing highways. Consequently, the major traffic effects would be caused by construction workers, both those commuting to the construction areas from neighboring communities and those that will reside at the construction camps. This traffic would generally use the existing roads. The volume of this traffic would be fairly low, enough so that even when combined with the existing traffic, it would easily be accommodated by the existing highway network. Traffic increases on various routes range from less than 200 vehicles per day to approximately 3,000 vehicles per day, well under the 10,000 vehicles per day capacity of two-lane facilities. During peak periods, however, congestion on some routes near the

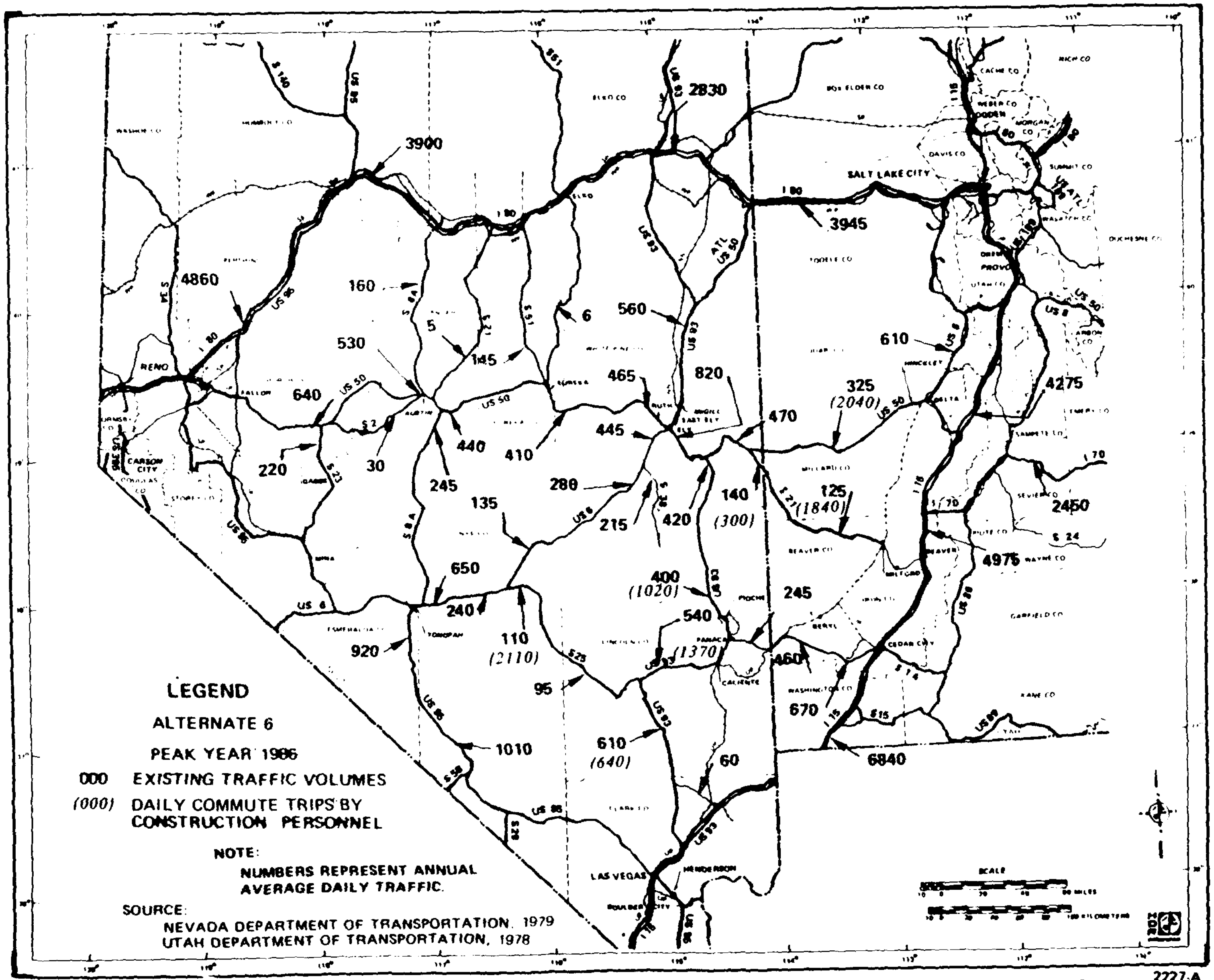

Figure 4.1-7. Projected daily commute trips by construction personnel for Alternative 8 - Nevada/Utah.

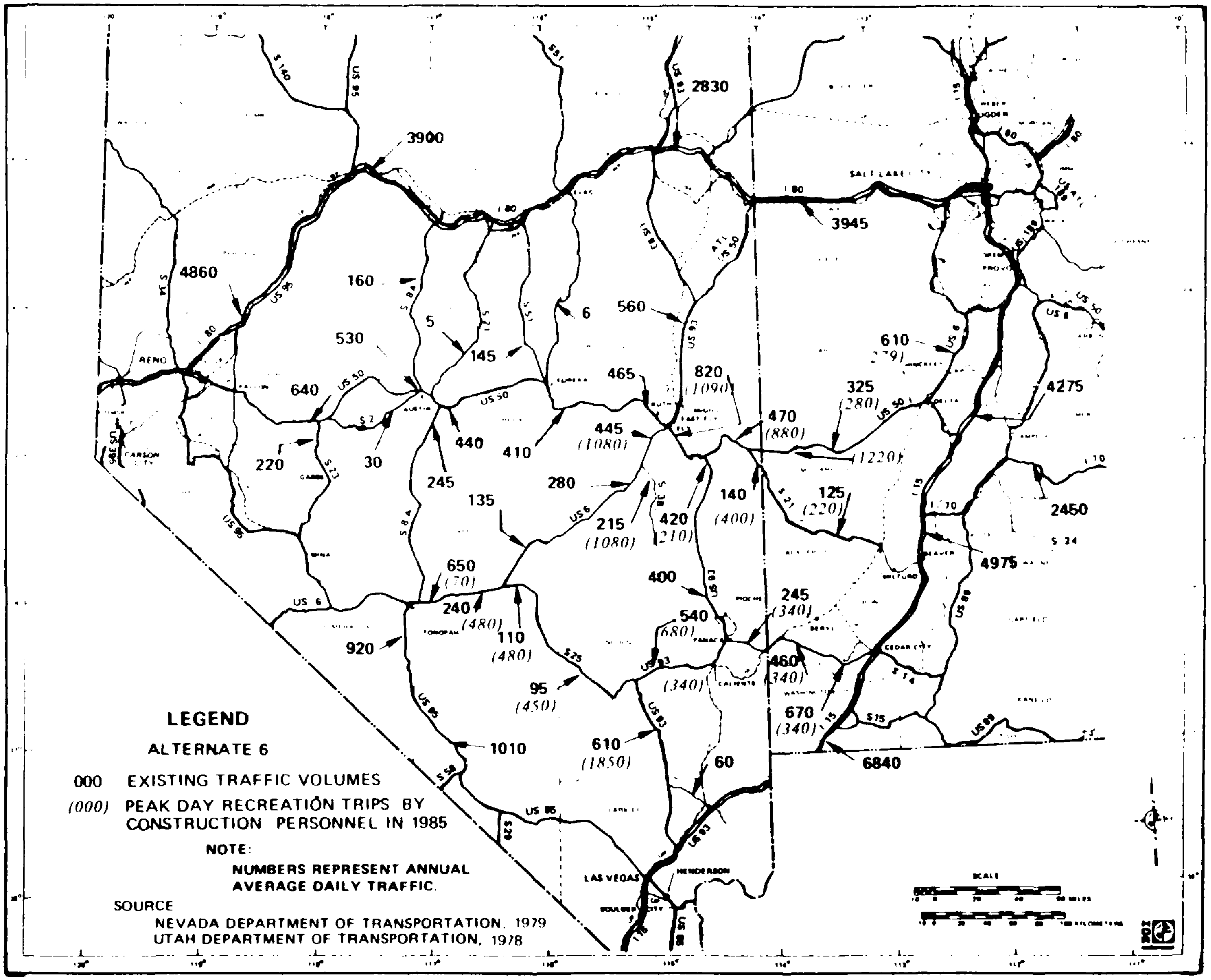

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Figure 4.1-8. Projected peak day recreation by construction personnel for Alternative 8 in 1985 - Nevada/Utah.

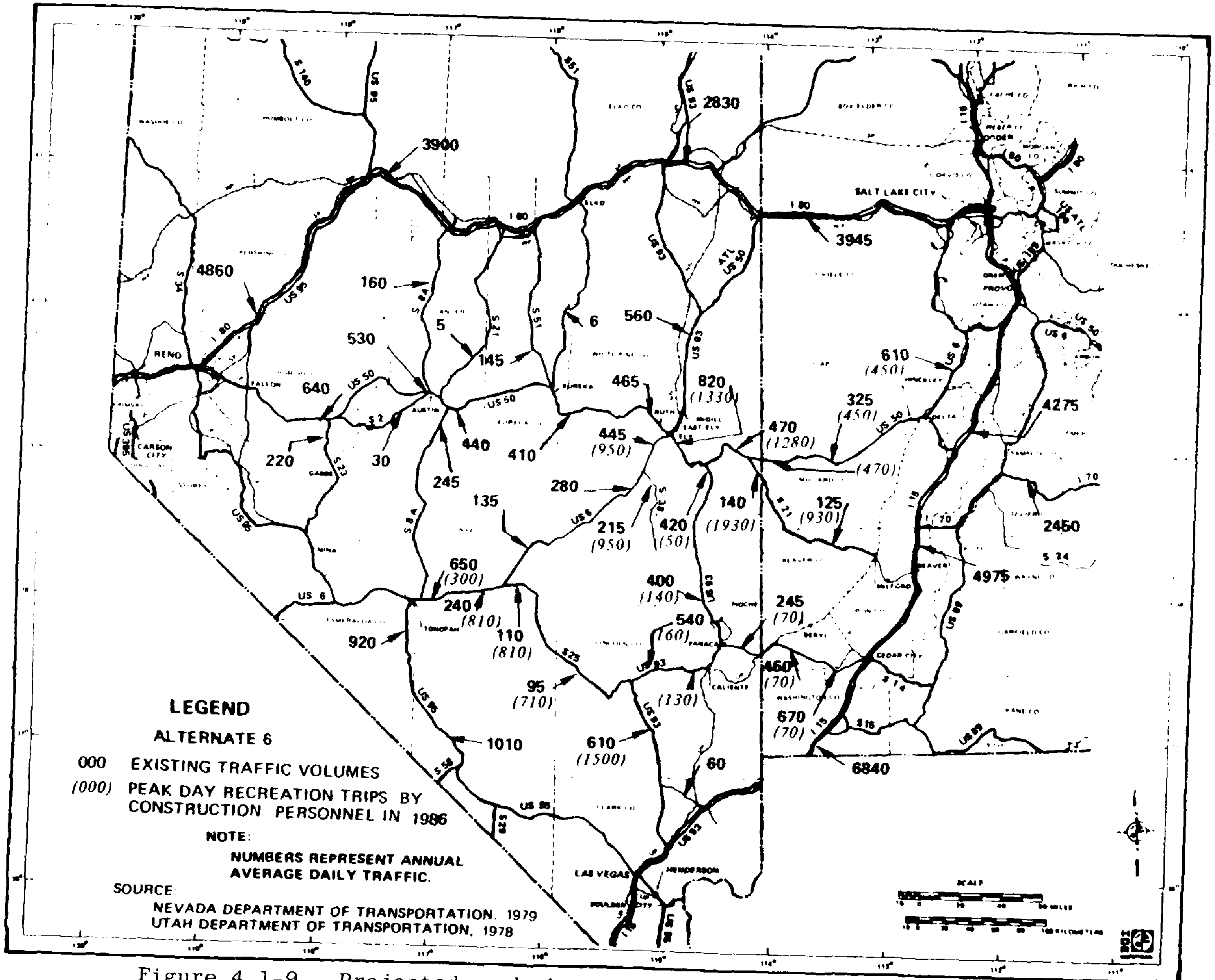


Figure 4.1-9. Projected peak day recreation by construction personnel for Alternative 8 in 1986 - Nevada/Utah.

2229-A

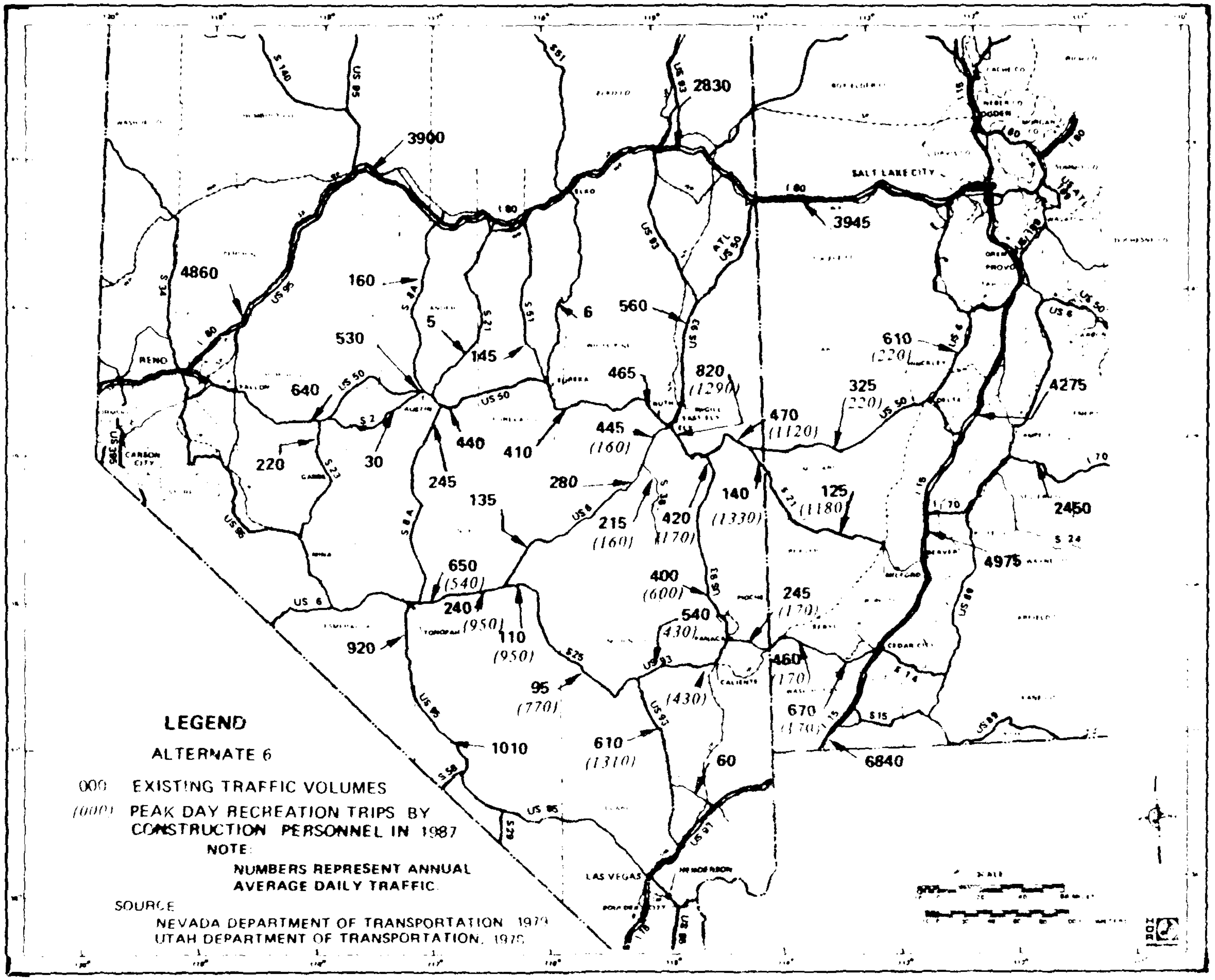


Figure 1.1-10. Projected peak day recreation by construction personnel for Alternative 8 in 1987 - Nevada/Utah.

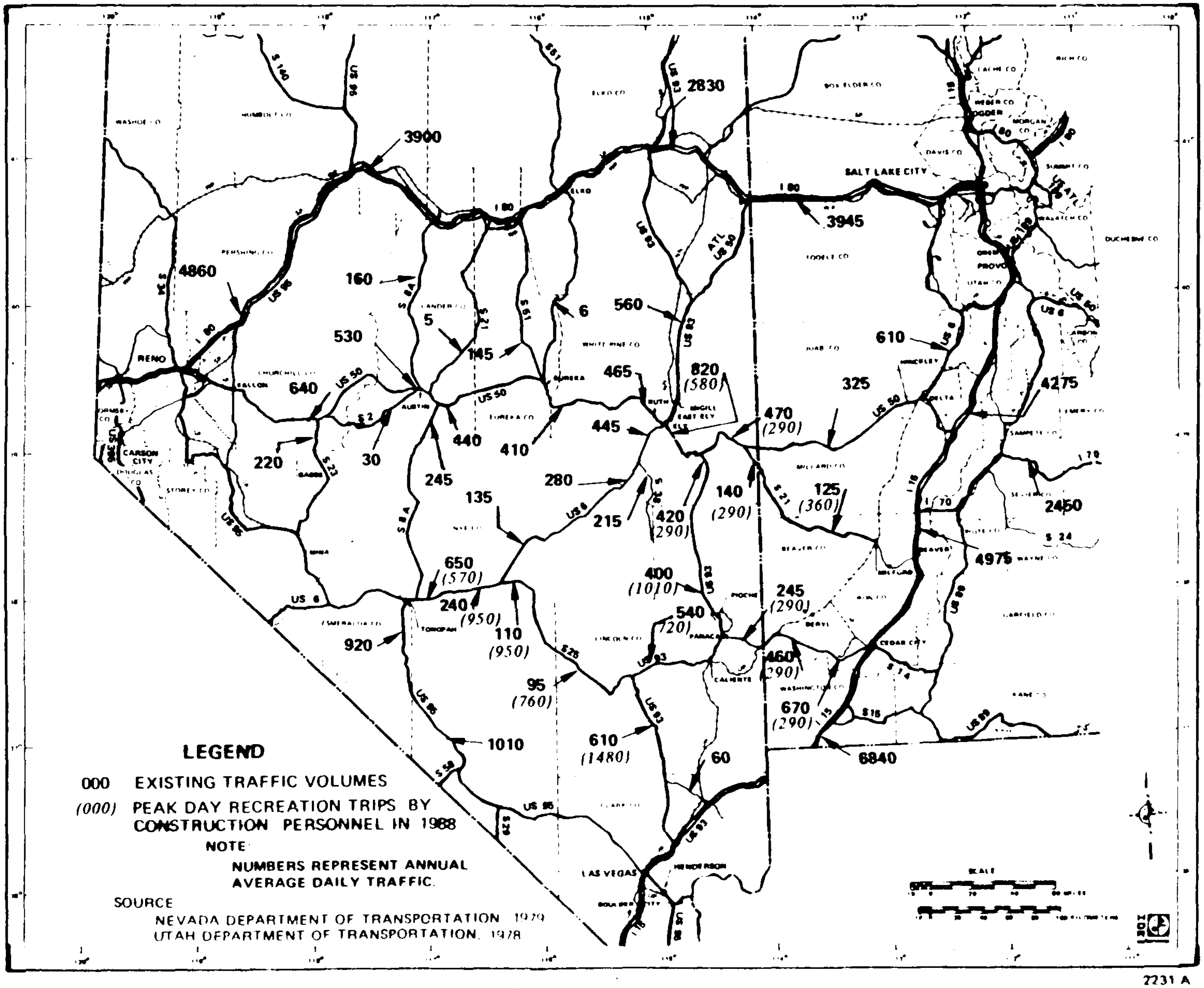


Figure 4.1-11. Projected peak day recreation by construction personnel for Alternative 8 in 1988 - Nevada Utah.

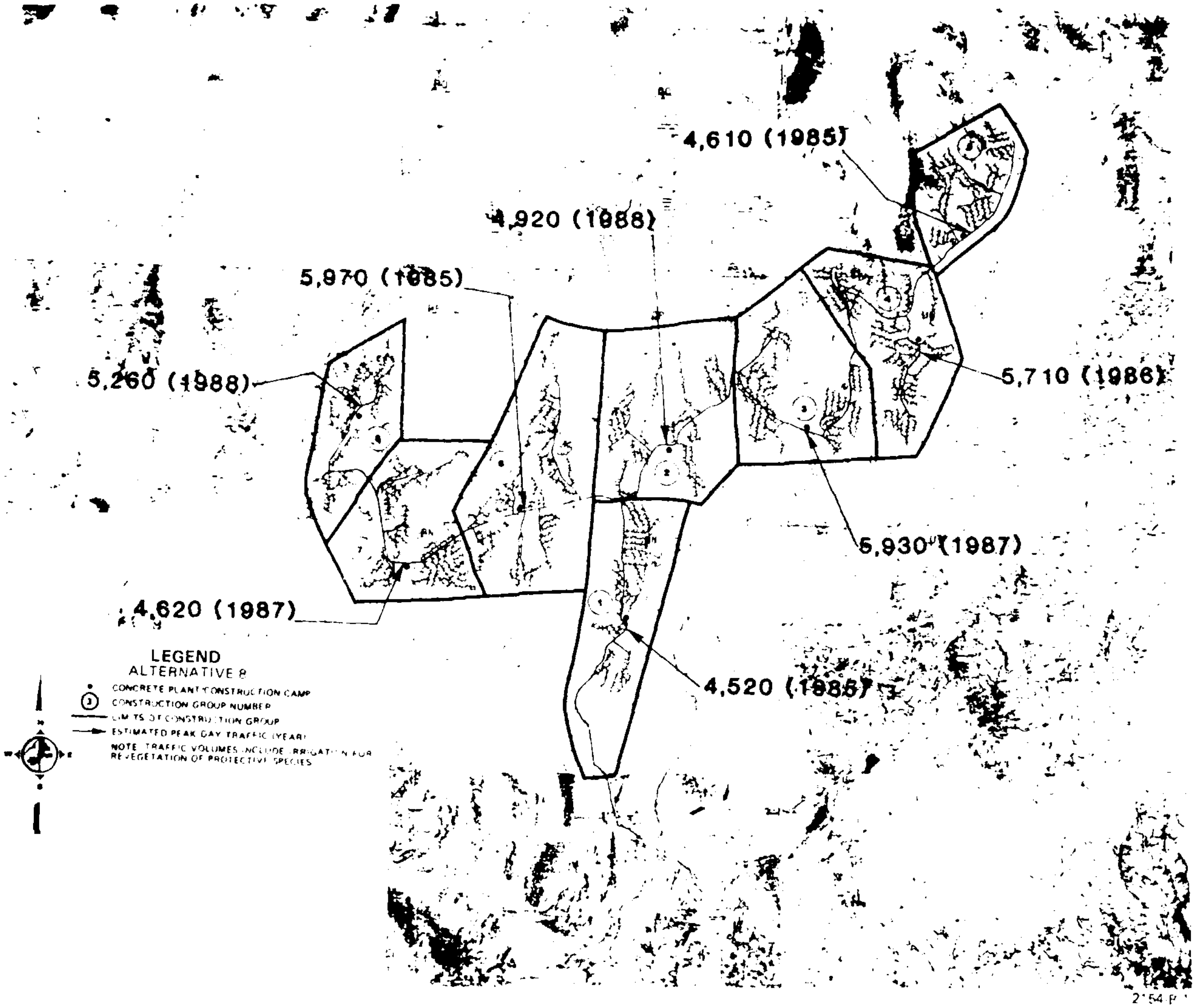


Figure 4.1-12. Peak day construction traffic - Nevada/Utah split.

construction camps would likely occur causing delay and inconvenience to motorists. The impacts will be short term, however, since each of the camps will only be in operation for two or three years and will be at peak production for only about one year.

The construction workers not living in the construction camps will make daily commute trips from neighboring communities. The anticipated commute trips along with current daily traffic volumes are shown on Figures 4.2-1 through 4.2-4. The number represent the highest volume of commute traffic that is expected for each segment of highway during each of the construction years 1985 through 1988.

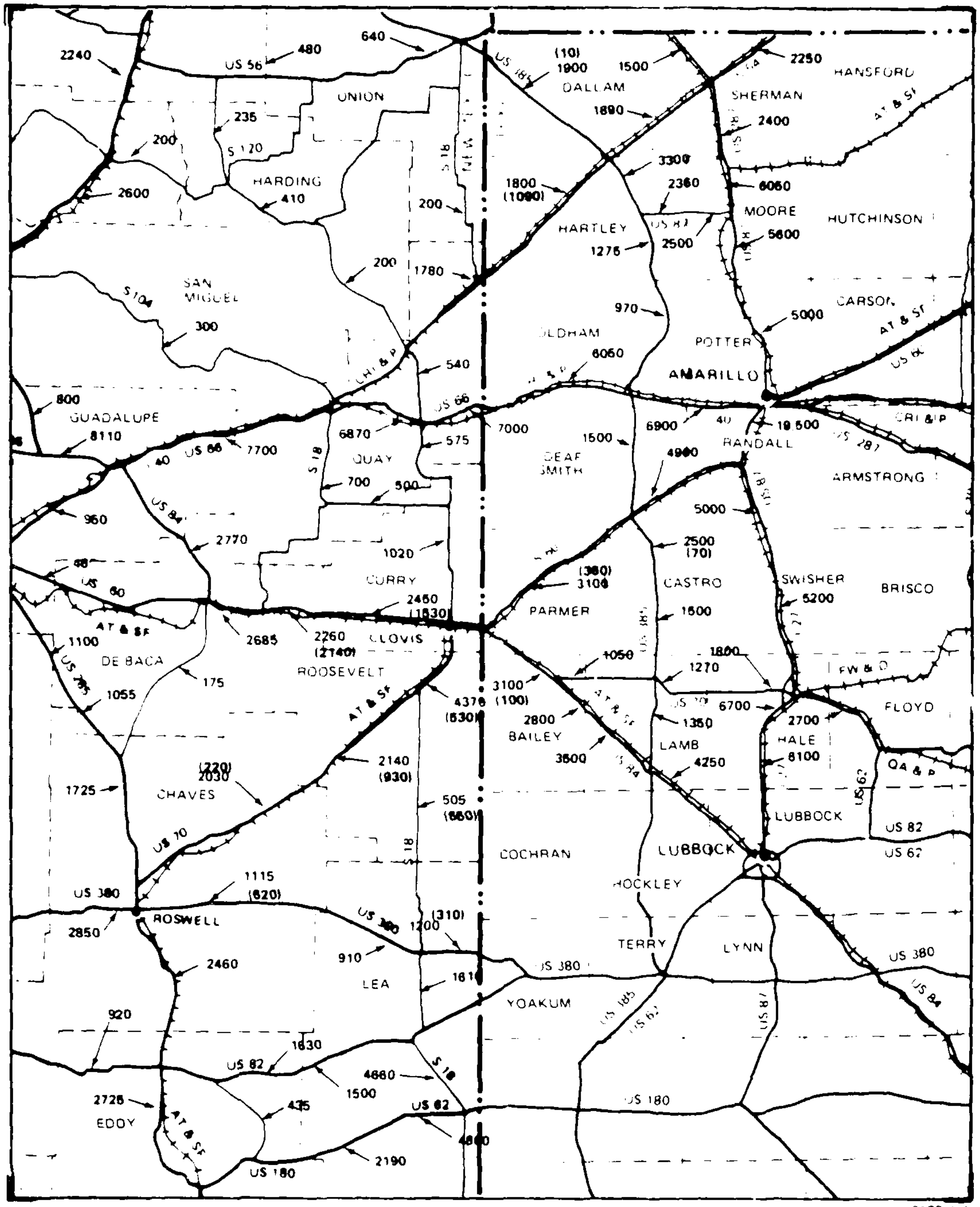
All of the construction workers living at the construction camps are expected to make recreation trips during the course of the project. These will principally occur on weekends or during shift changes and not on a daily basis. Figures 4.2-5 through 4.2-8 show the anticipated recreation trips for the year 1985 through 1988 which are the years during which the greatest amount of construction activity occurs.

Construction traffic itself will primarily use the DTN and cluster roads. It will vary from year to year and from area to area throughout the construction period. The peak traffic will be in the immedicate vicinity of each of the construction camps along the DTN. The volume and timing will depend upon the size and scheduling operation. Figure 4.2-9 shows the peak day construction traffic at various locations along the DTN and the years in which it will occur.

Some conflicts would occur between construction traffic and current highway traffic at points where the DTN and cluster roads cross or coexist with existing roads (Table 4.2-1). While there will be a large number of these intersections the actual effects on traffic should be small since at all points where the DTN crosses an existing route, a grade separation would be constructed. Moreover, cluster roads are specifically designed to avoid crossing or coexisting with any road that has average daily traffic over 250 vehicles. At some of these locations there would be localized short term delay to some motorists due to the crossing of construction vehicles. Localized improvements would be made where necessary to ensure safety and an orderly flow of traffic. These locations will be identified on a case by case basis and site-specific improvements will be made. This may include signing, signalization, or the temporary use of flagmen.

There would be some long-term benefits to the region since all of the newlv constructed roads will be available for use by the public including the DTN which will be a good quality paved facility. New roads constructed on the same alignment as existing unsurfaced roads will experience short-term interruptions that will cause delays or detouring of existing traffic but it will not be significant due to the very low volume of traffic on those roads. On the other hand, the long-term improvements will be an asset to the area.

The increase in traffic on the existing road system would likely increase the maintenance requirements. This would be especially true during the construction phase when supply trucks would be using the existing roads. The amount of additional maintenance required would vary for each segment of road and would depend upon such factors as the quality of the existing road, the number of heavy trucks that would use the road, and current maintenance practices.



NOTE
NUMBERS REPRESENT ANNUAL AVERAGE DAILY TRAFFIC

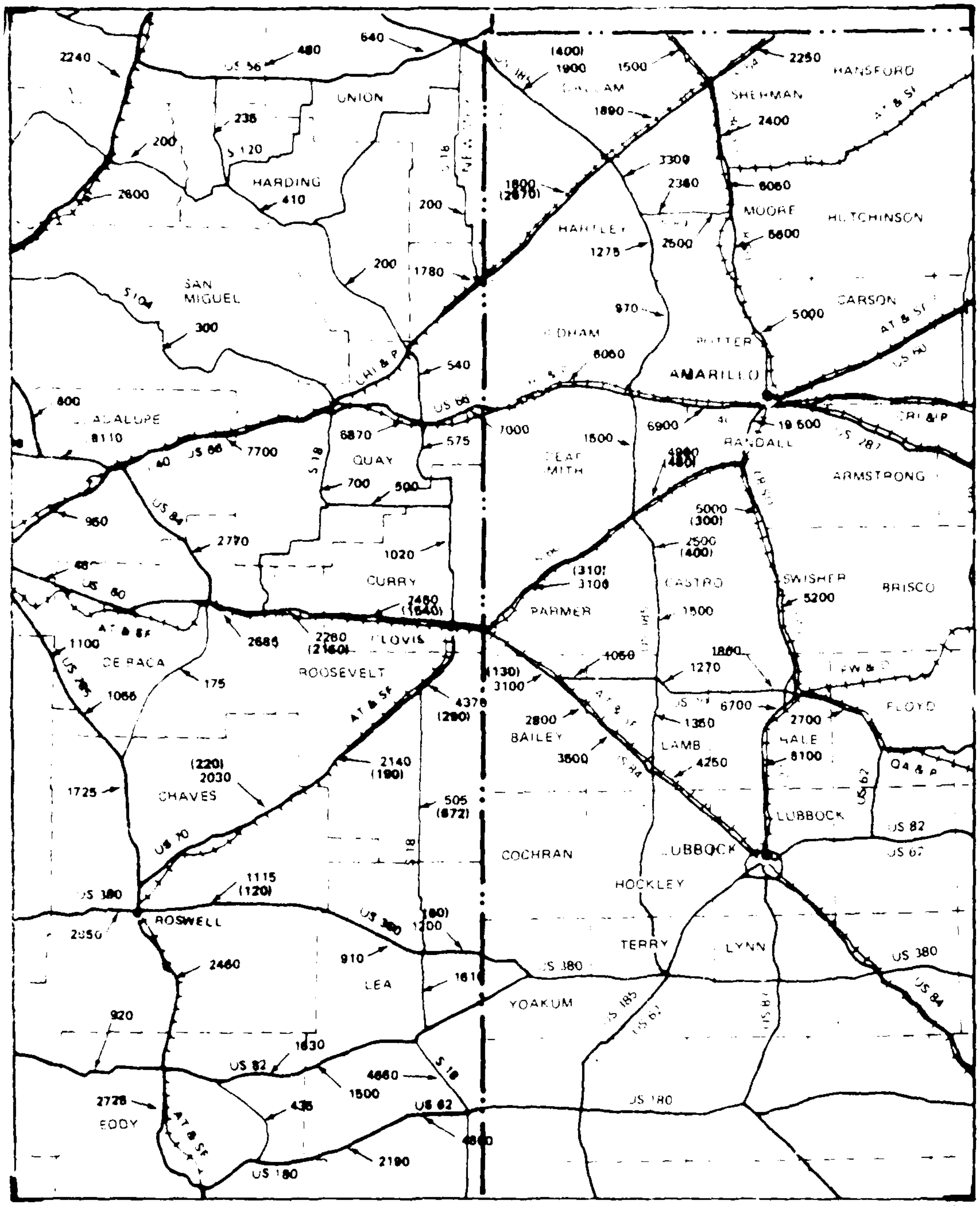
SCALE

10 0 20 40 60 MILES

10 0 20 40 60 KILOMETERS

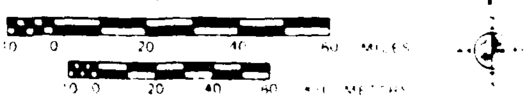
LEGEND
ALTERNATIVE 7
000 - EXISTING TRAFFIC VOLUMES
(000) - DAILY COMMUTE TRIPS MADE BY CONSTRUCTION PERSONNEL IN 1985

Figure 4.2-1. Projected dail, commute trips by construction personnel in 1985 - Texas/New Mexico.



NOTE
NUMBERS REPRESENT ANNUAL AVERAGE DAILY TRAFFIC

SCALE



LEGEND

ALTERNATIVE 7

000 – EXISTING TRAFFIC VOLUMES

(000) – DAILY COMMUTE TRIPS MADE BY CONSTRUCTION PERSONNEL IN 1986

Figure 4.2-2. Projected daily commute trips by construction personnel in 1986 - Texas New Mexico.

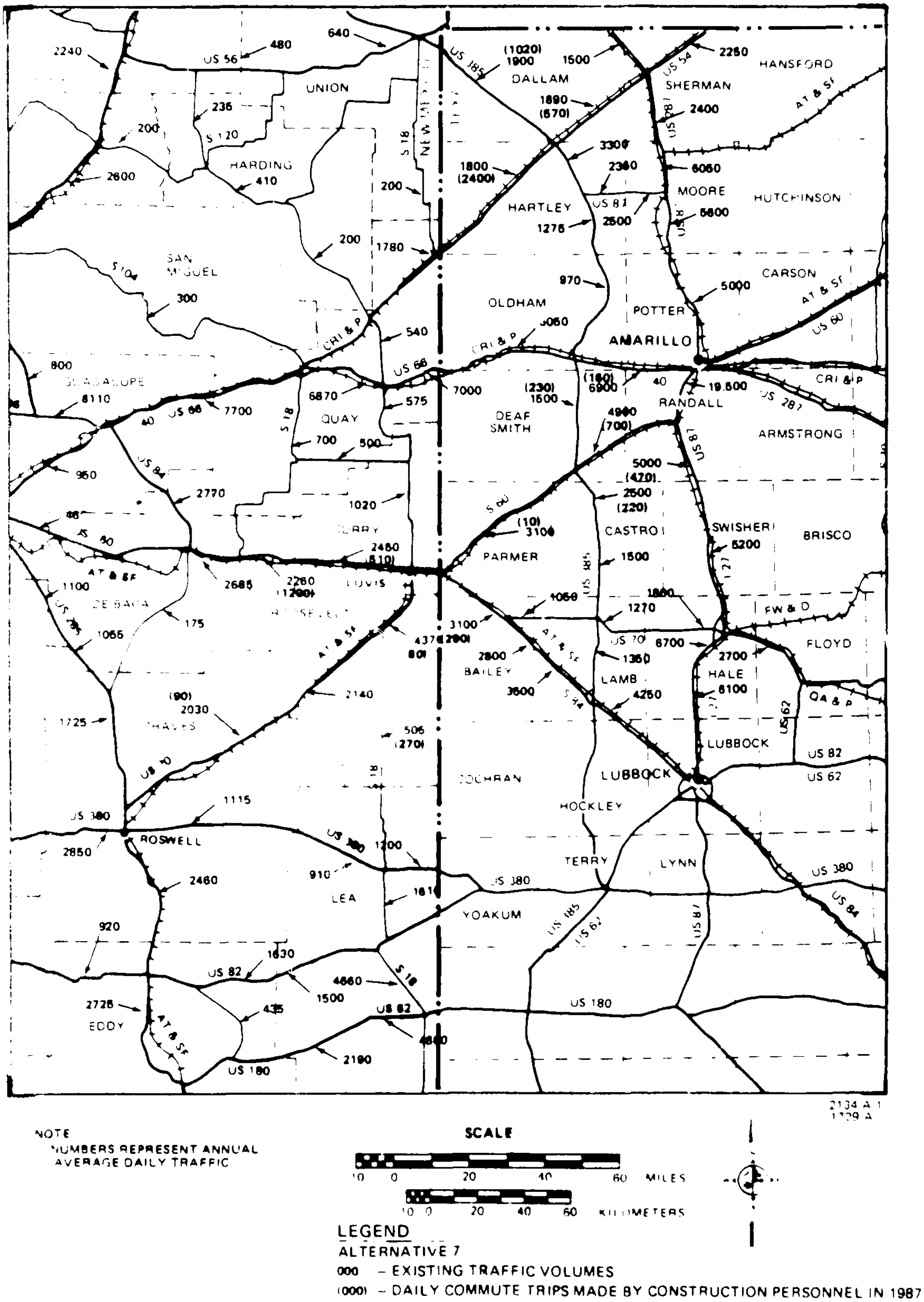
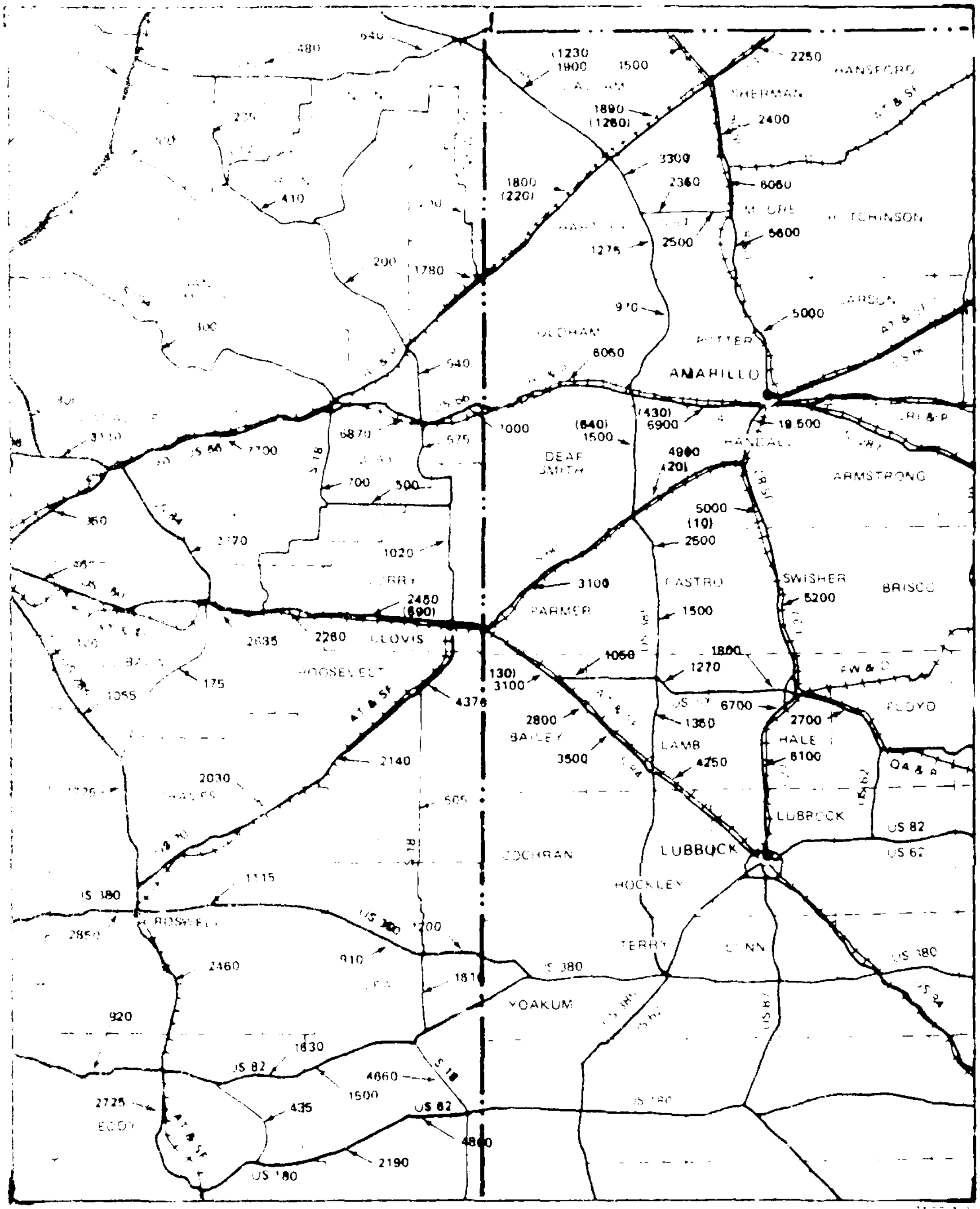


Figure 4.2-3. Projected daily commute trips by construction personnel in 1987 - Texas/New Mexico.



NOTE
NUMBERS REPRESENT ANNUAL AVERAGE DAILY TRAFFIC

SCALE

LEGEND
ALTERNATIVE 7
000 - EXISTING TRAFFIC VOLUMES
(000) - DAILY COMMUTE TRIPS MADE BY CONSTRUCTION PERSONNEL IN 1988

Figure 4.2-4. Projected daily commute trips by construction personnel in 1988 - Texas New Mexico.

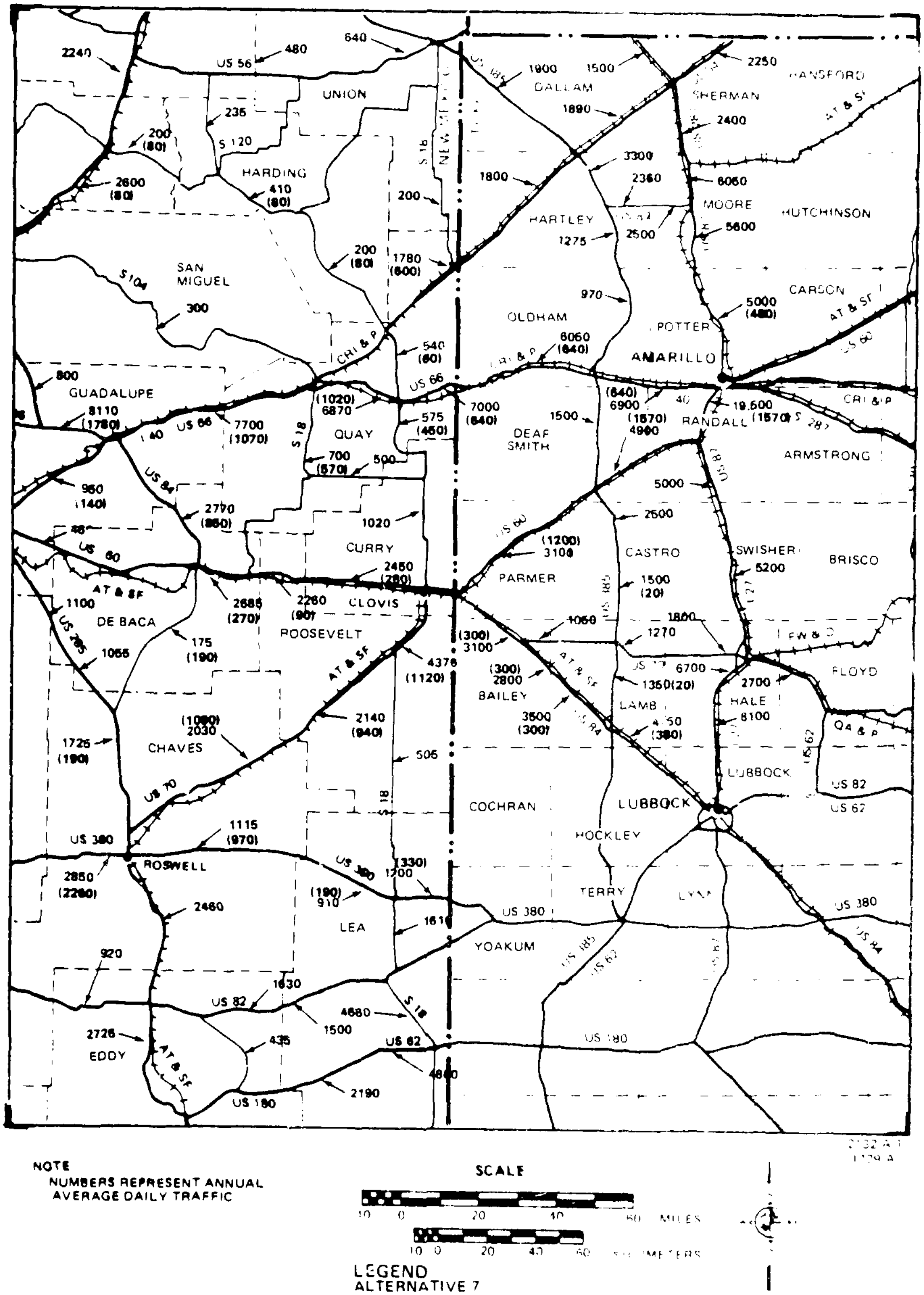
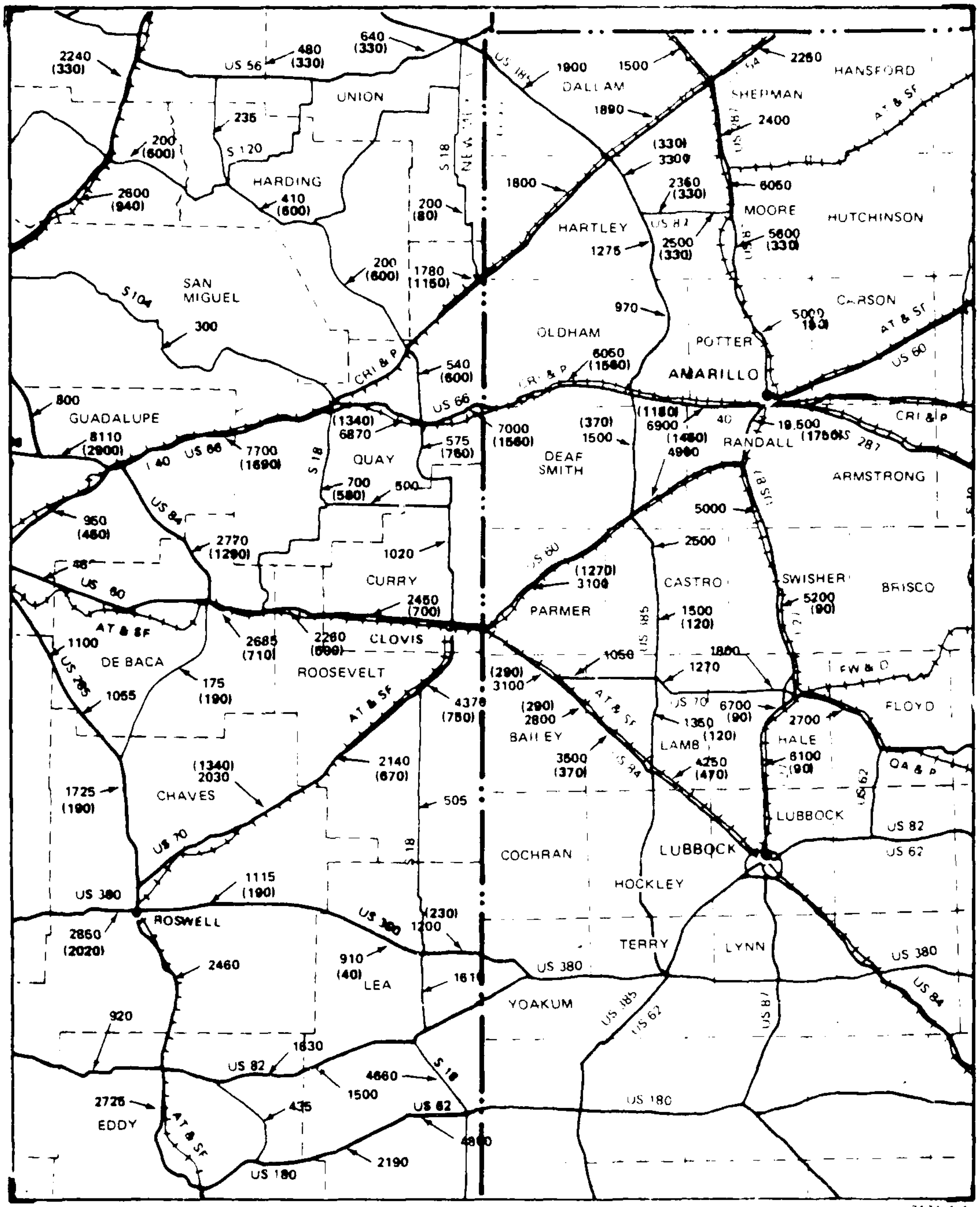


Figure 4.2-5. Projected peak day recreation trips by construction personnel in 1985 - Texas/New Mexico.



NOTE
NUMBERS REPRESENT ANNUAL AVERAGE DAILY TRAFFIC

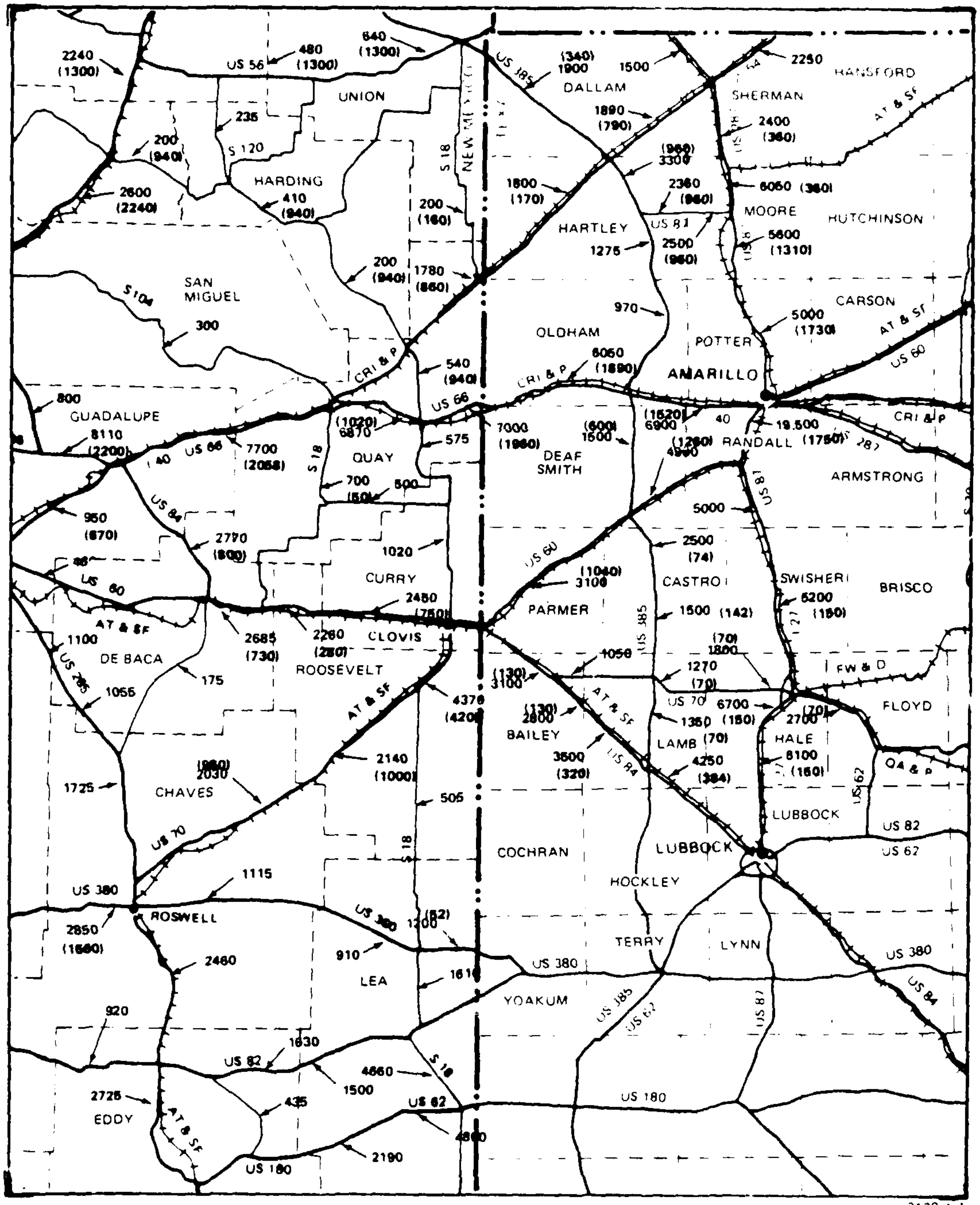
SCALE

10 0 20 40 60 MILES

10 0 20 40 60 KILOMETERS

LEGEND
ALTERNATIVE 7
000 – EXISTING TRAFFIC VOLUMES
(000) – PEAK DAY RECREATION TRIPS MADE BY CONSTRUCTION PERSONNEL IN 1986

Figure 4.2-6. Projected peak day recreation trips by construction personnel in 1986 - Texas/New Mexico.



NOTE
NUMBERS REPRESENT ANNUAL AVERAGE DAILY TRAFFIC

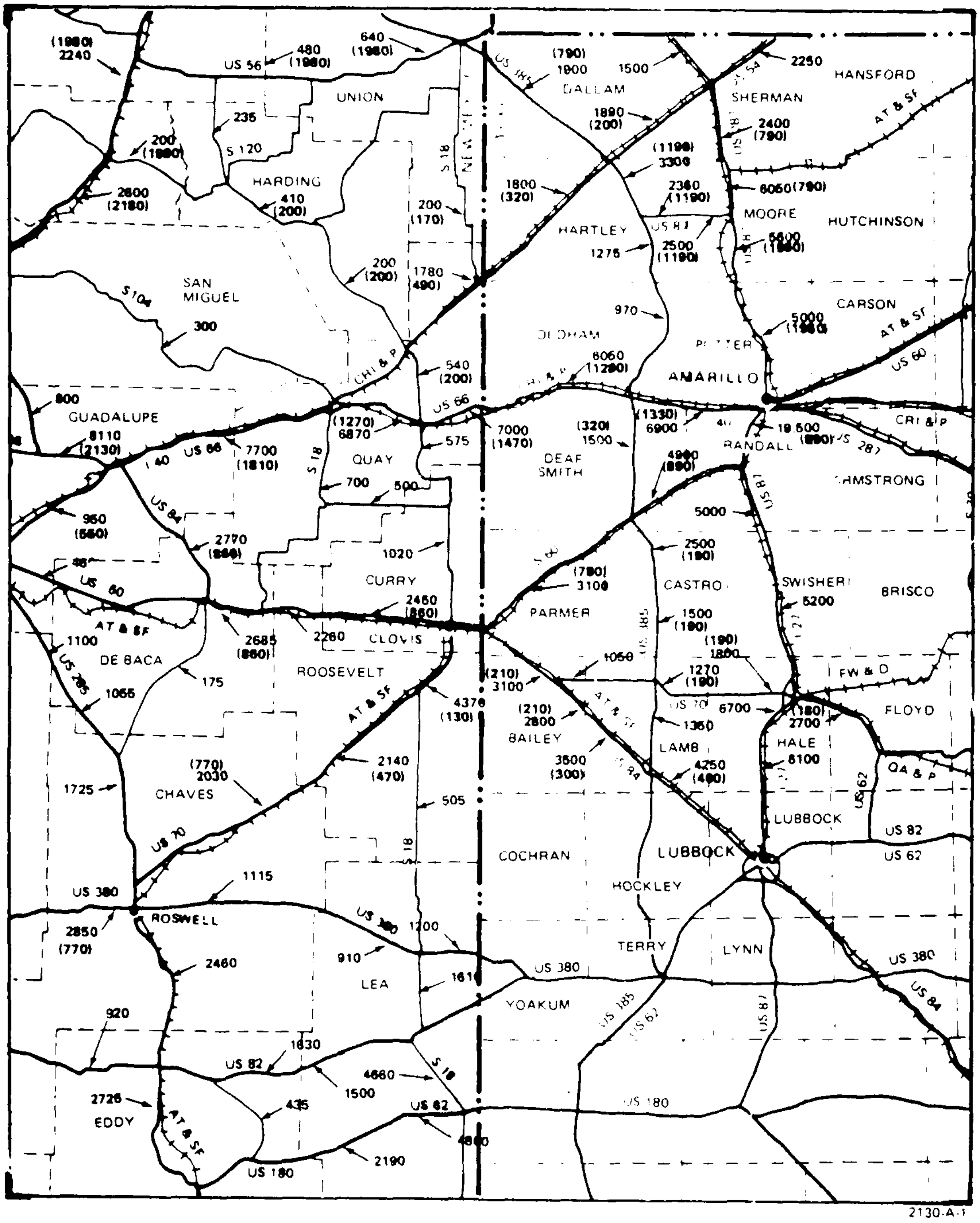
SCALE

10 0 20 40 60 MILES

10 0 20 40 60 KILOMETERS

LEGEND
ALTERNATIVE 7
000 – EXISTING TRAFFIC VOLUMES
(000) – PEAK DAY RECREATION TRIPS MADE BY CONSTRUCTION PERSONNEL IN 1987

Figure 4.2-7. Projected peak day recreation trips by construction personnel in 1987 - Texas/New Mexico.



NOTE:
NUMBERS REPRESENT ANNUAL AVERAGE DAILY TRAFFIC

SCALE

10 0 20 40 60 MILES

10 0 20 40 60 KILOMETERS

LEGEND
ALTERNATIVE 7
000 – EXISTING TRAFFIC VOLUMES
(000) – PEAK DAY RECREATION TRIPS MADE BY CONSTRUCTION PERSONNEL IN 1988

Figure 4.2-8. Projected peak day recreation trips by construction personnel in 1988 - Texas/New Mexico.

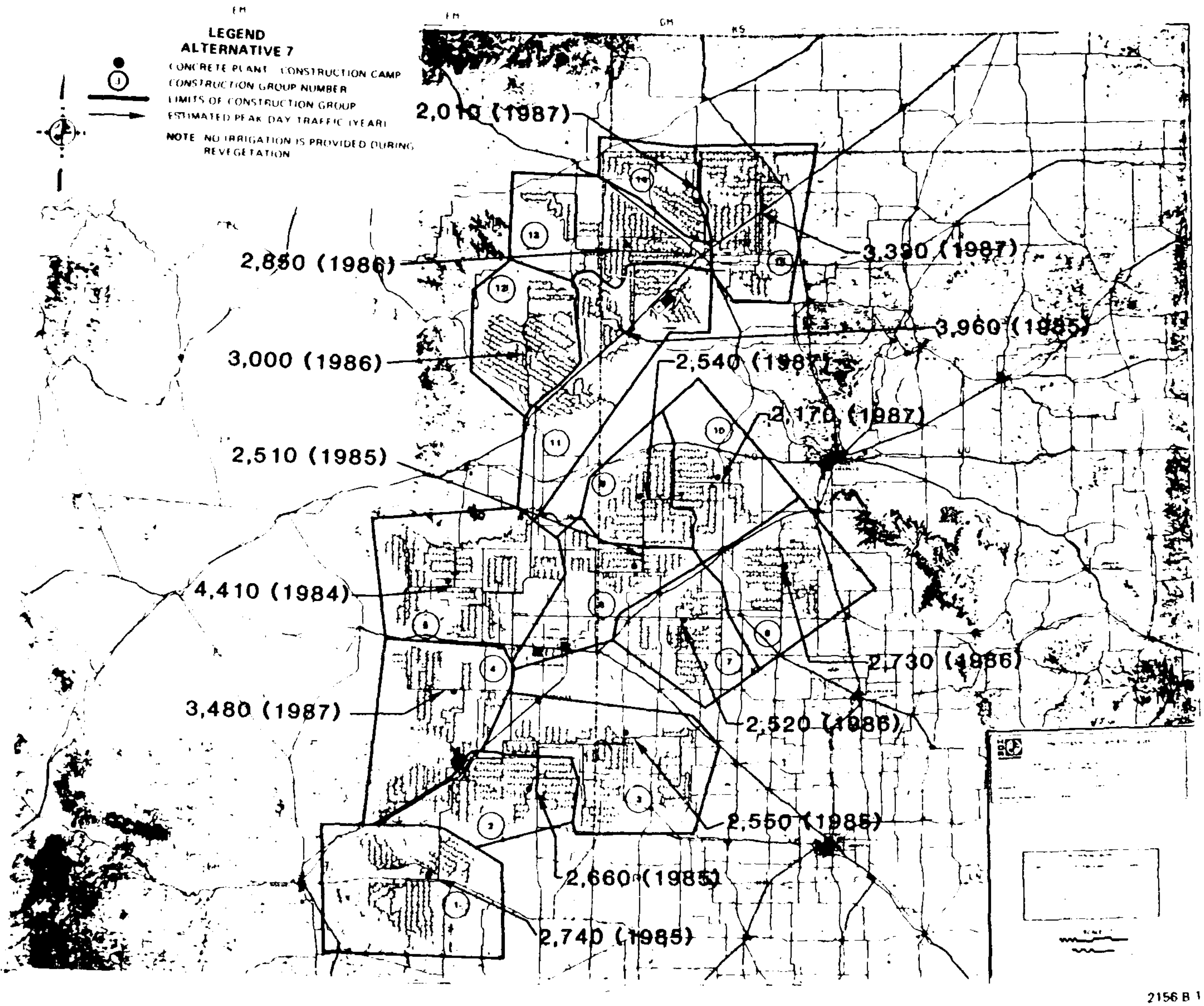


Figure 4.2-9. Projected peak day construction traffic in DTN - Texas/New Mexico.

Table 4.2-1. Intersections between existing roads and railroads and proposed project roads - Texas/New Mexico.

ALTERNATE	DEPLOYMENT[2]		INTERSECTIONS WITH EXISTING ROADS					INTERSECTIONS WITH RAILROADS AND THE DTN
			DTN			CLUSTER ROADS[3]		
	TEXAS	NEW MEXICO	FEDERAL OR STATE	PAVED	OTHER	PAVED	OTHER	
7	102	98	26	66	394	173	2,100	16
8	20	80	18	51	214	96	1,276	10

3013-1

[1]At all intersections with state and federal routes, county roads with average daily traffic over 500 vehicles per day and all railroad crossings, overpasses will be constructed.

[2]Number of clusters in each state.

[3]Cluster roads are specifically designed not to intersect with any road that has an average daily traffic over 250 vehicles per day.

The communities within the study region would almost all experience some increase in traffic but these increases would amount to approximately 2,000 vehicles per day or less. This magnitude of increase would not significantly affect the majority of Texas/New Mexico communities within the study region, although some short-term traffic problems may occur. The towns of Dimmitt and Hereford are possible exceptions. Additional traffic on U.S. 385 through these communities anticipated for Alternative 7 may require some localized roadway improvements such as short segments of widening to ensure that traffic is adequately accommodated. For Alternative 8 no traffic impacts are anticipated for these communities.

During the operations phase the volume of traffic that would use the existing road system would be very small, averaging only a few vehicles per day. The movement of missile components would be confined to the DTN which would not affect traffic on the existing roads.

4.3 PROPOSED OPERATING BASE LOCATIONS

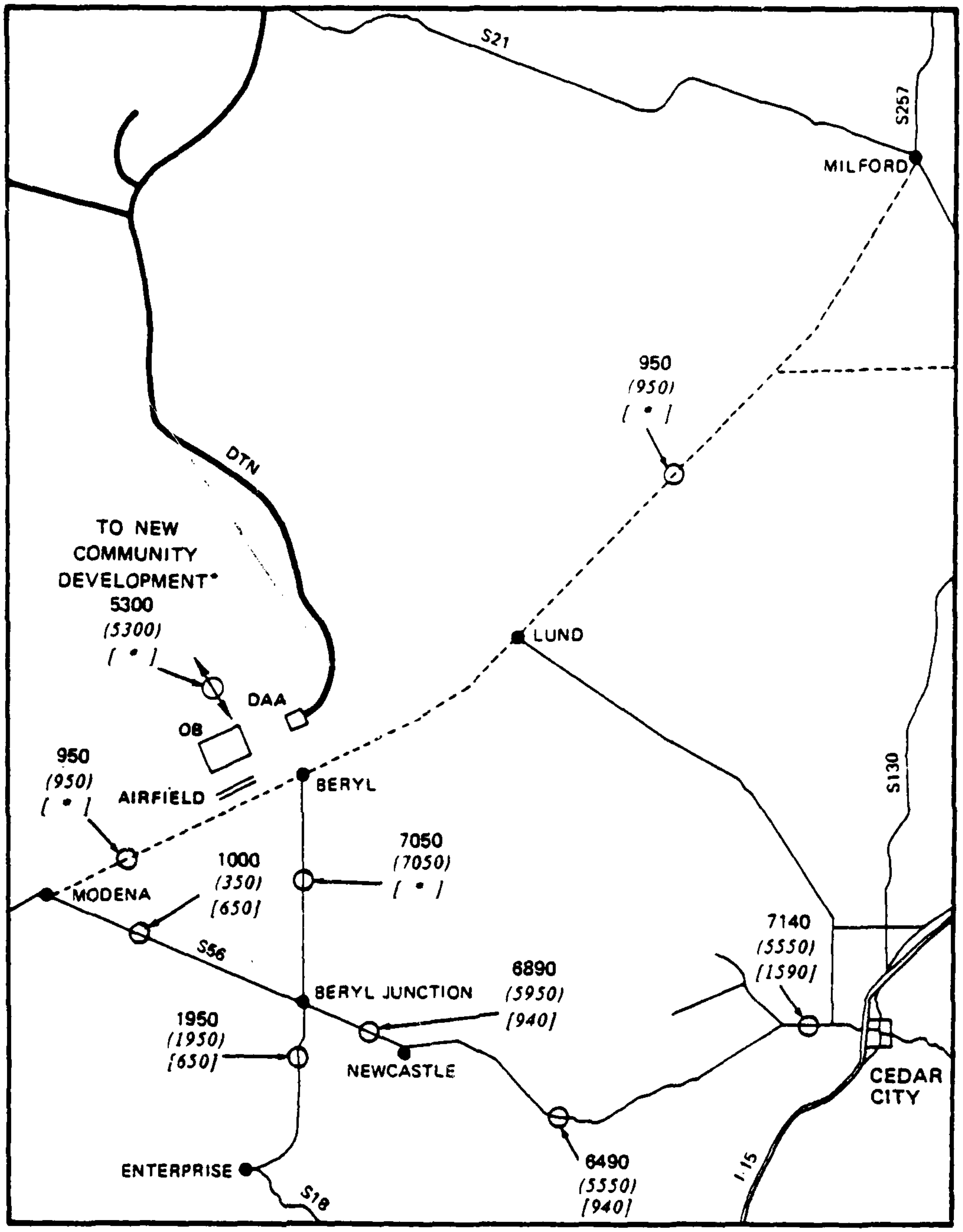
BERYL, UTAH (4.3.1)

The employment opportunities generated by construction and operation of an operating base near Beryl would result in a large influx of people into the area and a corresponding increase in traffic. This growth in traffic would develop within the base itself, on the adjacent road system and in neighboring communities. Adverse impacts would occur when the growth in traffic causes delay and inconvenience to motorists or where road improvements are needed to accommodate the anticipated traffic.

For the most part the location and magnitude of the impacts depend upon where the offbase development occurs. The amount of offbase development and the corresponding increases in traffic are dependent upon the number of military and civilian employees that move into the area and would reside in communities near the base. Once the base is fully operational 20 percent of the military personnel and their dependents would live in communities near the base and commute to work, as would all of the civilian employees. In addition to the commute trips, the military personnel and their dependents would make additional trips to the base to take advantage of the shopping and other amnenities provided on the base. Besides the population increases associated with direct employment opportunities, there would be additional in-migration to satisfy the indirectly generated employment opportunities. All of these people would be making numerous trips within the communities in which they reside. It is the total traffic generated by all in-migrants that cause the impacts.

For traffic analysis purposes in this report, each new household was assumed to generate 10 trips, or traffic movements, on an average day comprised of all home based trips, including work trips, and non-home based trips. When new M-X induced employment opportunities are satisfied by indigenous population it was assumed that travel patterns would change to reflect travel to the new employment center, the operating base.

Each of the communities near the site, notably Cedar City, Enterprise, and Newcastle, are expected to have direct and indirect M-X induced growth and corresponding increases in traffic. Figures 4.3.1-1 and 4.3.1-2 present traffic



LEGEND 000 - TOTAL 1992 TRAFFIC
(000) - MX TRAFFIC
[000] - 1992 TRAFFIC WITHOUT MX
*See text for discussion

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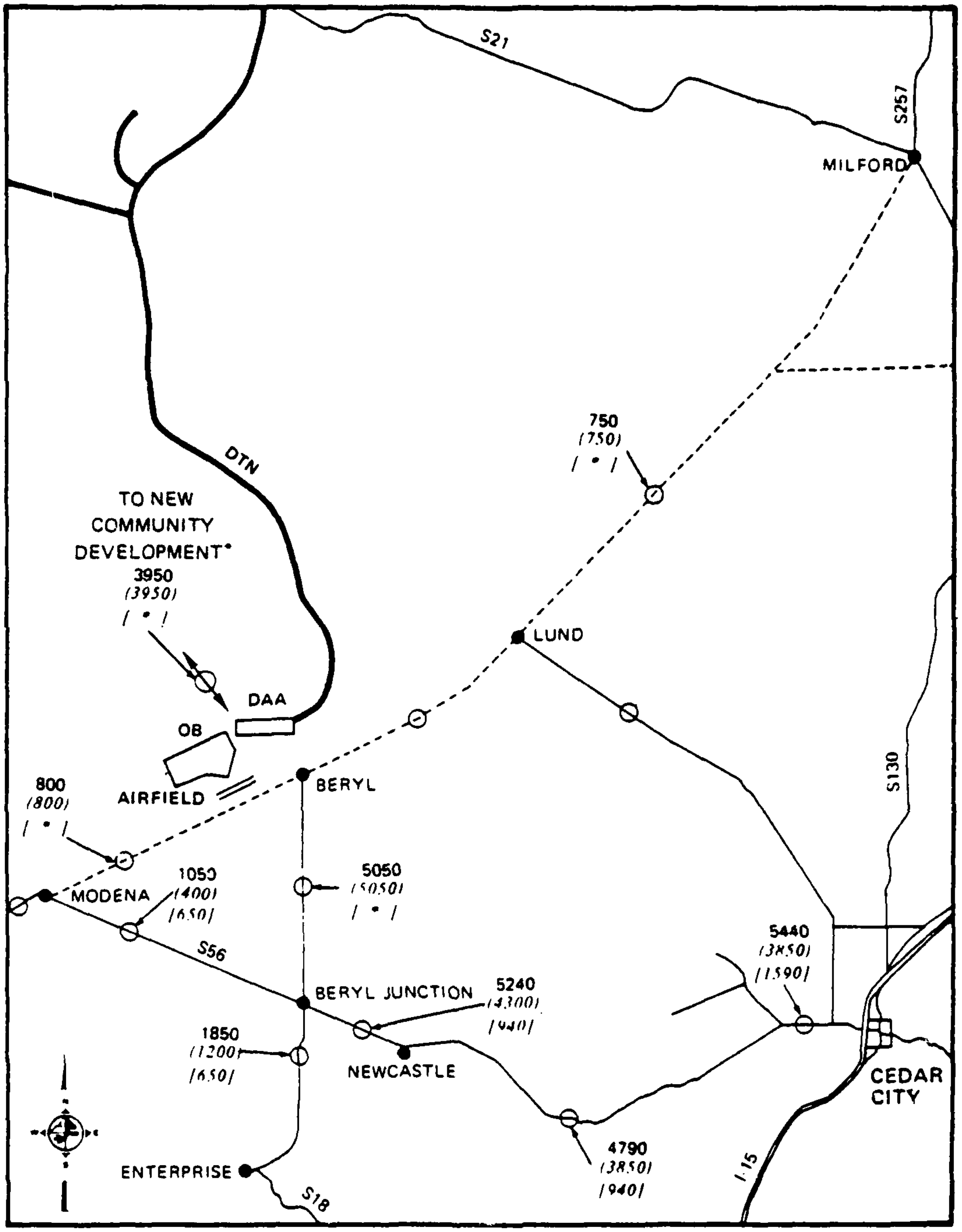
Figure 4.3.1-1. Projected traffic volumes in the vicinity of Beryl, Utah - first operating base.



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LEGEND 000 - TOTAL 1992 TRAFFIC
(000) - MX TRAFFIC
/000/ - 1992 TRAFFIC WITHOUT MX
*See text for discussion

Figure 4.3.1-2. Projected traffic volumes in the vicinity of Beryl, Utah - second operating base.

estimates for the vicinity of the operating base. Shown are estimates for a first and second operating base including future baseline traffic without the project, assuming the high baseline case, and M-X related traffic. 1992 was used for analysis purposes since it represents the long term, steady state condition that is expected to continue over the life of the project.

State route 56 between Beryl Junction and Cedar City would have a substantial increase in traffic, but it should still be less than the capacity of the two lane road even during peak periods, whether a first or second base is constructed. The road between Beryl and Beryl Junction will have to carry the largest volume of traffic and will probably have to be improved.

Almost 1,500 new households are anticipated within Iron County as a result of in-migration to satisfy the employment opportunities created by the Proposed Action. These would generate nearly 15,000 new trips, or traffic movements. Provisions, including new roads as well as new homes, would have to be made to accommodate the growth. The communities of Newcastle and Enterprise would probably receive a large enough increase in traffic under either base scenario to strain the existing transportation infrastructure. Good planning and orderly development can prevent many traffic problems from developing, but localized traffic problems requiring road improvements or modifications would probably be required on the existing street system. Specific impacts would depend upon where growth actually occurs and the number of persons who choose to reside in or near those communities. Cedar City is a larger community and less likely to have significant traffic problems attributable to the M-X induced growth although some problems may occur.

Because of the remoteness of the site it is assumed for purposes of traffic analysis that a "new town" type of development would occur near the base which would attract about 40 percent of the base personnel who do not live on the base. "New town" development is consistent with the Iron County Master Plan which encourages growth in existing communities but which recognizes that "new towns" may be required if new industries, presumably including military bases, locate in remote areas not contiguous to existing communities. Presumably, the development would be planned in a manner to preclude traffic problems. In the event this development did not occur, there would be correspondingly larger growth and, therefore, more traffic in the other communities.

The traffic generated on the base would primarily stay on the base itself with only a small portion having offbase destinations. Therefore, it would have no effect on the adjacent road system. The trips made to offbase destinations by base personnel have been included in the traffic estimates presented herein.

During the construction phase there would be a large temporary increase in population within the local communities. These would be the people participating in construction of the operating base, the Assembly and Check Out personnel, the people participating in construction of the facilities in the neighboring communities that will be necessary to accommodate the new permanent residents, and the support people for all of the temporary workers. All of these people would remain only a few years and by 1992 they would all have moved out of the area, leaving only the permanent residences.

During the time these people are living in the area they will be generating traffic. The impacts associated with this short term level of traffic could occur in either of two ways depending upon how the local communities planned for the traffic. If no special provisions were made to accommodate this short-term growth, the traffic would likely strain the street system, exceeding capacity at critical locations and along major routes. At those locations congestion would occur, especially during peak periods. The amount and the extent of the short-term impacts would depend upon where the temporary housing was located as well as where the new permanent development would occur. However, once the construction period was over, the traffic would subside to the levels anticipated for the long-term operations phase.

On the other hand, if the street system was expanded to the extent necessary to accommodate the short-term traffic levels, then the traffic would flow smoothly without congestion, but the cost of expanding the road system would be a major impact. Once the short-term effect was over, the road system would be more than adequate to accommodate the long-term traffic levels. In either case the short-term impacts would be significant.

COYOTE SPRING, NEVADA (4.3.2)

The major increase in population and the corresponding increase in traffic that would occur as a result of construction and operation of an operating base at Coyote Spring would occur in Las Vegas. The anticipated in-migration of over 1,100 new households under the Proposed Action will generate around 11,000 new trips or traffic movements on an average day once the base is fully operational. Many of which will be destined for the operating base. In addition, 1,150 new jobs on the operating base, expected to be satisfied by the indigenous population, will result in many additional trips to the base from the neighboring communities. In general, the impacts associated with this traffic increase would be similar to those discussed for the Beryl site in Section 4.3.1.

Figures 4.3.2-1 and 4.3.2-2 present fugure traffic estimates for the vicinity of Coyote Spring including baseline traffic without the project, M-X related traffic and total or composite traffic. As shown, there would be about 20 percent more traffic if the site is used for a first operating base, as in the Proposed Action, than for a second operating base. Refer to Section 4.3.1 for a discussion of the assumptions on traffic generation.

The largest impacts on traffic associated with this growth would be on the roads connecting the base with the neighboring communities. U.S. 93 between the proposed operating base site and the intersection of I-15 would have to carry as many as 10,000 vehicles per day if the first operating base is constructed at Coyote Spring. This would include up to 2,000 commuters, most of which would travel during peak hours. In order to accommodate this volume of traffic the existing road would have to be widened to four lanes.

State Highway 7 between the base and the Moapa Valley would have to carry about 3,500 vehicles per day by 1992 which would be a five-fold increase in traffic. Although this would be well below the capacity of the road, each of the small communities could be impacted. Localized traffic problems requiring road improvements may result at some locations on the main routes.

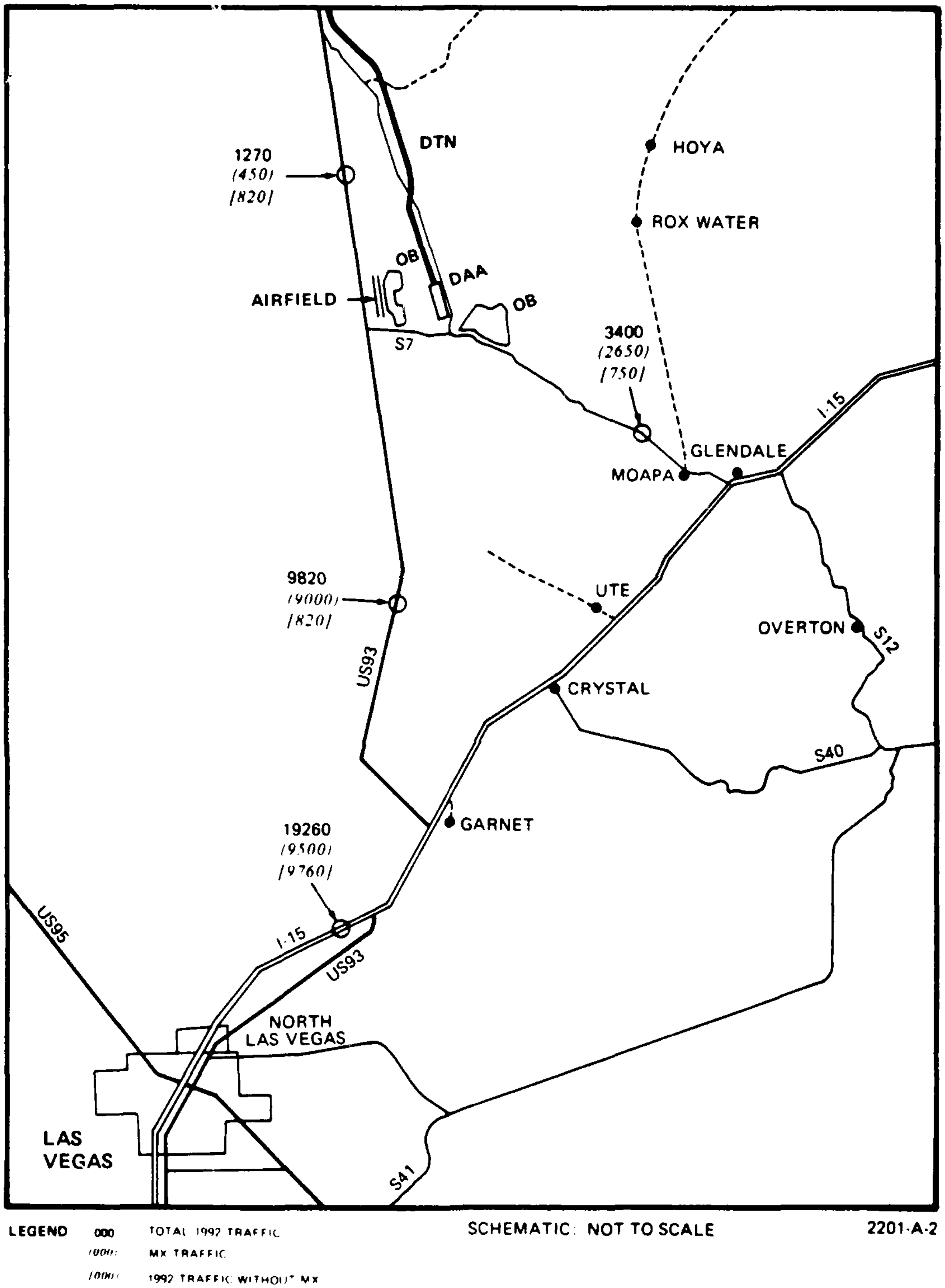

Figure 4.3.2-1. Projected traffic volumes in the vicinity of Coyote Spring, Nevada - first operating base.

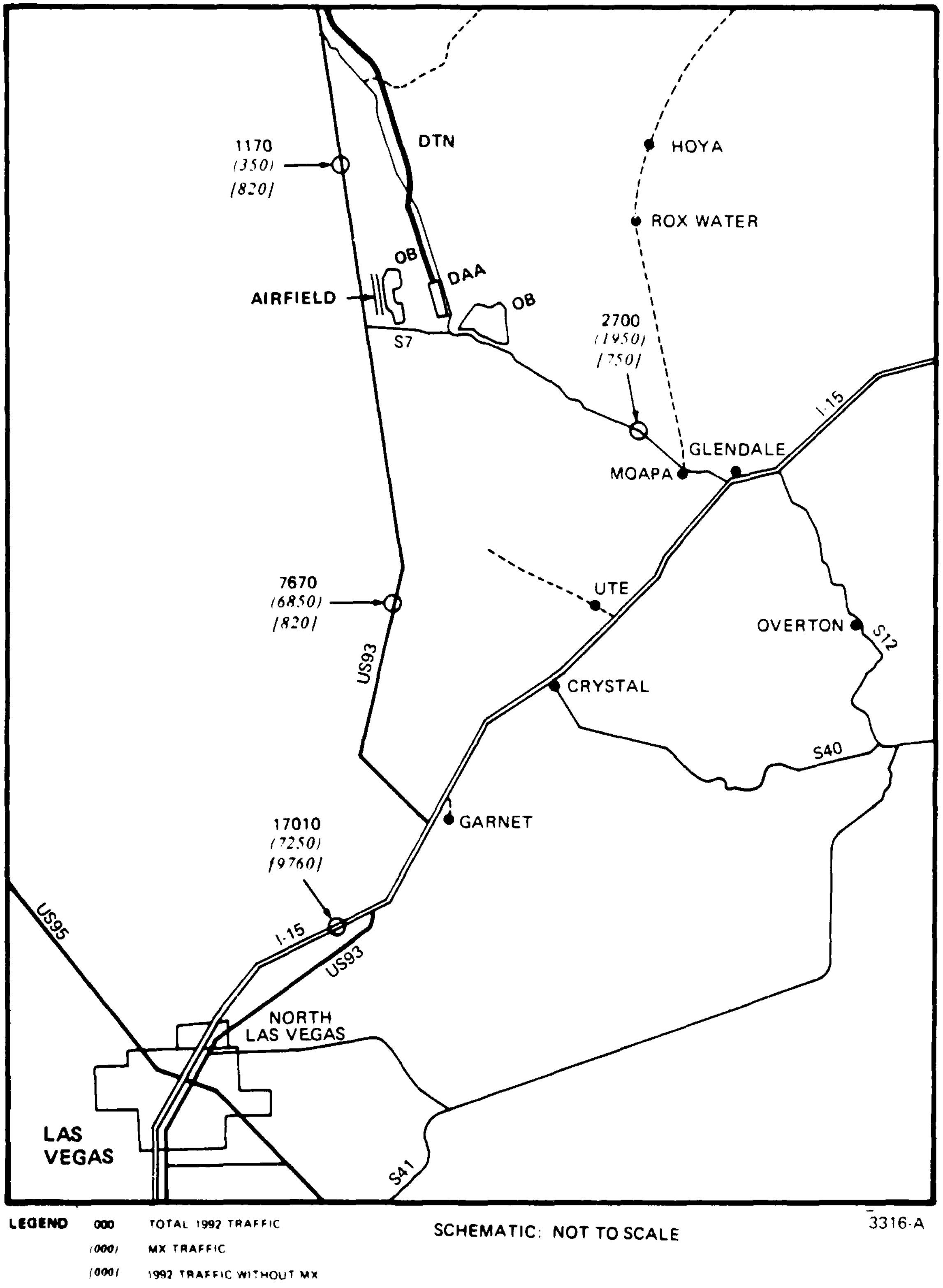

Figure 4.3.2-2. Projected traffic volumes in the vicinity of Coyote Spring, Nevada - second operating base.

DELTA, UTAH (4.3.3)

The population increases associated with construction and operation of an operating base near Delta would have a significant impact on traffic in the surrounding area. In general, the impact would be similar to those discussed for the Beryl site in Section 4.3.1.

The portion of U.S. 6-50 between the proposed operating base site and Delta would receive the greatest amount of traffic growth due to the project. The anticipated 10,000 vehicles per day, including up to 2,000 commuters, would exceed the capacity of the existing road. Figure 4.3.3-1 presents the anticipated 1992 traffic. That section of highway would have to be widened to four lanes to accommodate the anticipated traffic without severe congestion. (Refer to Section 4.3.1 for a discussion of the assumptions on traffic generation.) Staggered work shifts and substantial use of buses and carpools could reduce the volume of traffic and possibly obviate the need to to widen the road. However, spot improvements would probably still be needed at intersecions near the base and within the communities of Hinckley and Delta to adequately handle the traffic. The roads between Delta and the communities of Fillmore, Holden, and Nephi would all have increased traffic but major improvements would not be required.

The anticipated in-migration of around 1,500 new households into Millard County would generate approximately 15,000 trips or traffic movements, on an average day. Most of these, probably around 75 percent, would probably originate in the immediate vicinity of Delta and Hinckley. Major additions to the street system as well as modifications and improvements to the existing streets would be required.

The other nearby communities would also be affected but to a lesser degree. The extent of the impacts would depend upon the specific growth patterns and the number of persons that choose to live within each community. Localized traffic problems may result at some locations, however, and improvements or modifications may be required at specific points.

ELY, NEVADA (4.3.4)

The population increases associated with construction and operation of an operating base near Ely would have a corresponding impact on traffic in the surrounding area. In general, the impact would be similar to those discussed for the Beryl site in Section 4.3.1.

The existing highway between the proposed operating base site and Ely would have the greatest increase in traffic as a result of the project. The combination of baseline traffic and M-X-induced traffic would exceed the capacity of the existing road. If the operating base is constructed at this location, the road would have to be widened to four lanes. Figure 4.3.4-1 presents the anticipated 1992 traffic. Implementation of mitigation measures such as staggered work shifts and/or substantial use of buses and carpools could eliminate the need to widen the road for the entire distance but capacity improvements would still be needed near the base and on the approach to Ely.

The community of Ely and its immediate vicinity is expected to absorb [illegible] the project induced growth (as much as 80 percent which was assumed [illegible]

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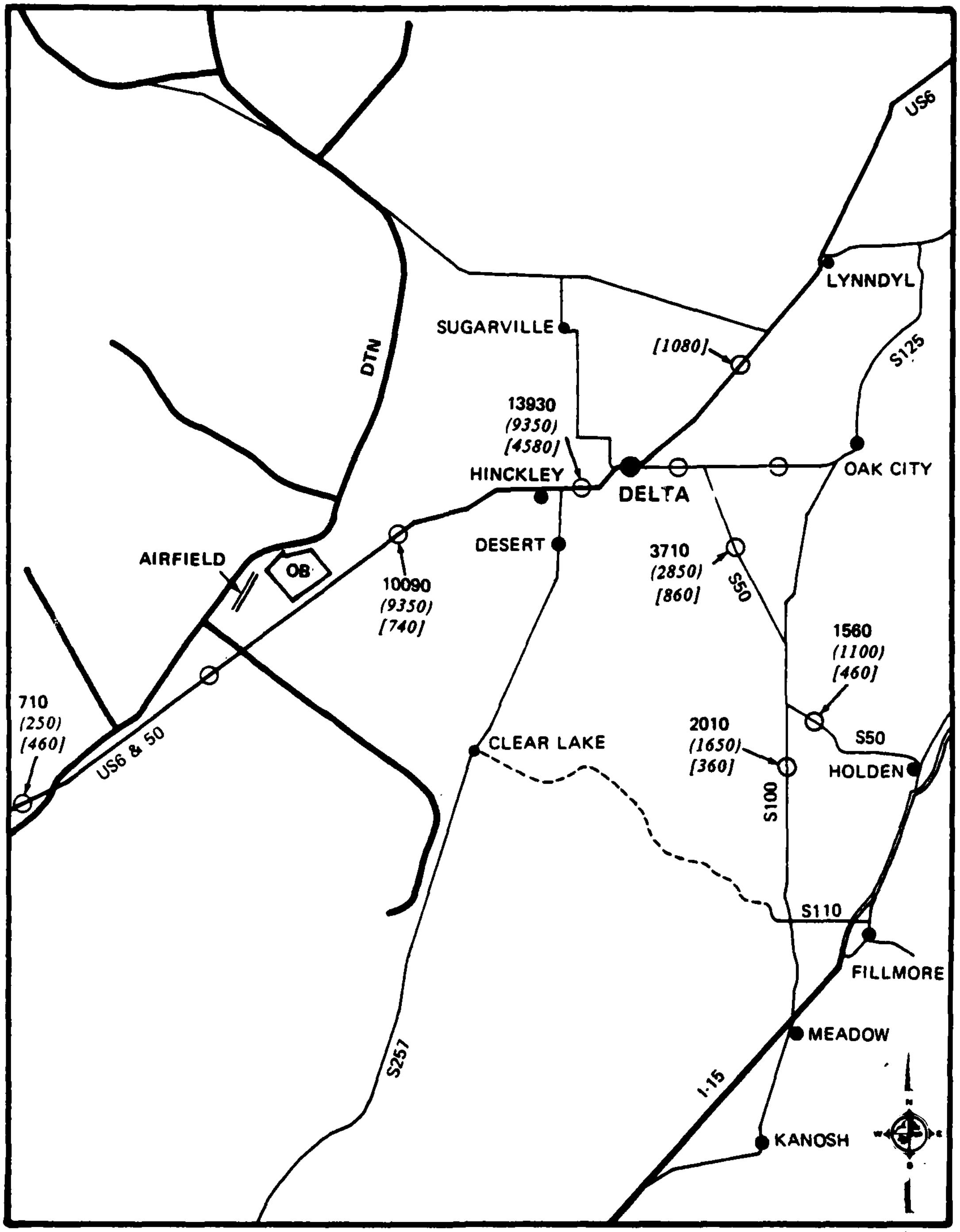

LEGEND 000 - TOTAL 1992 TRAFFIC
(000) - MX TRAFFIC
[000] - 1992 TRAFFIC WITHOUT MX

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SCHEMATIC: NOT TO SCALE

Figure 4.3.3-1. Projected traffic volumes in the vicinity of Delta, Utah - second operating base.

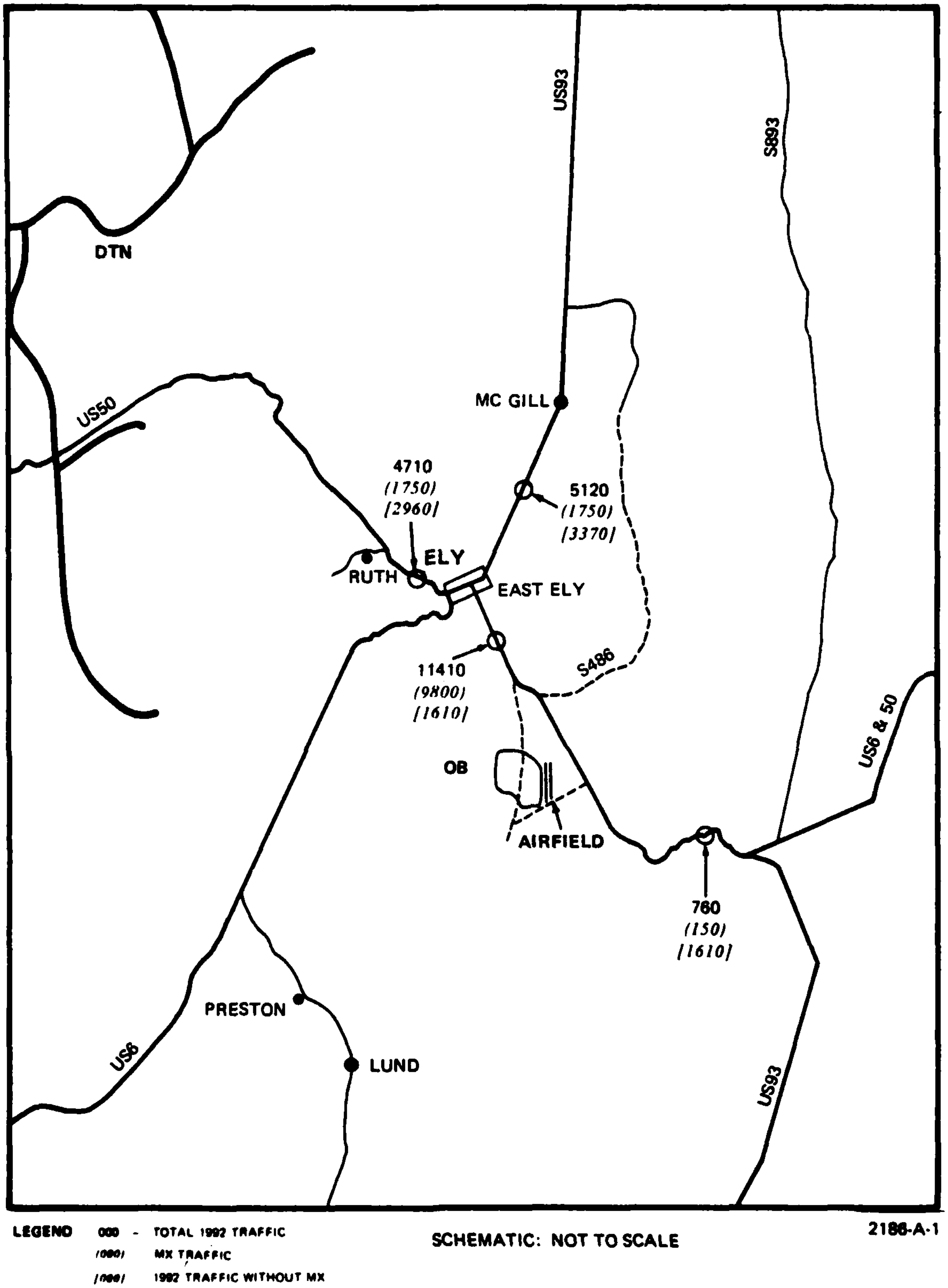

Figure 4.3.4-1. Projected traffic volumes in the vicinity of Ely, Nevada - second operating base.

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estimating purposes). The community would about double in population with a corresponding increase in traffic. Provisions, including new streets as well as new housing, would have to be made to accommodate the anticipated in-migration. The addition of around 1,500 new households would generate approximately 15,000 trips, or traffic movements, on an average day. Good planning and orderly development can prevent many traffic problems from occurring but improvements would undoubtedly have to be made at numerous locations on existing streets to properly accommodate the additional traffic. Where these improvements would be needed would depend upon the specific growth patterns that develop. Refer to Section 4.3.1 for a discussion of the assumptions on traffic generation used to develop traffic estimates.

The communities of Ruth and McGill are also expected to experience some growth as a result of the project but much less than Ely. While some localized traffic problems may occur at a few locations, substantial traffic problems are not anticipated.

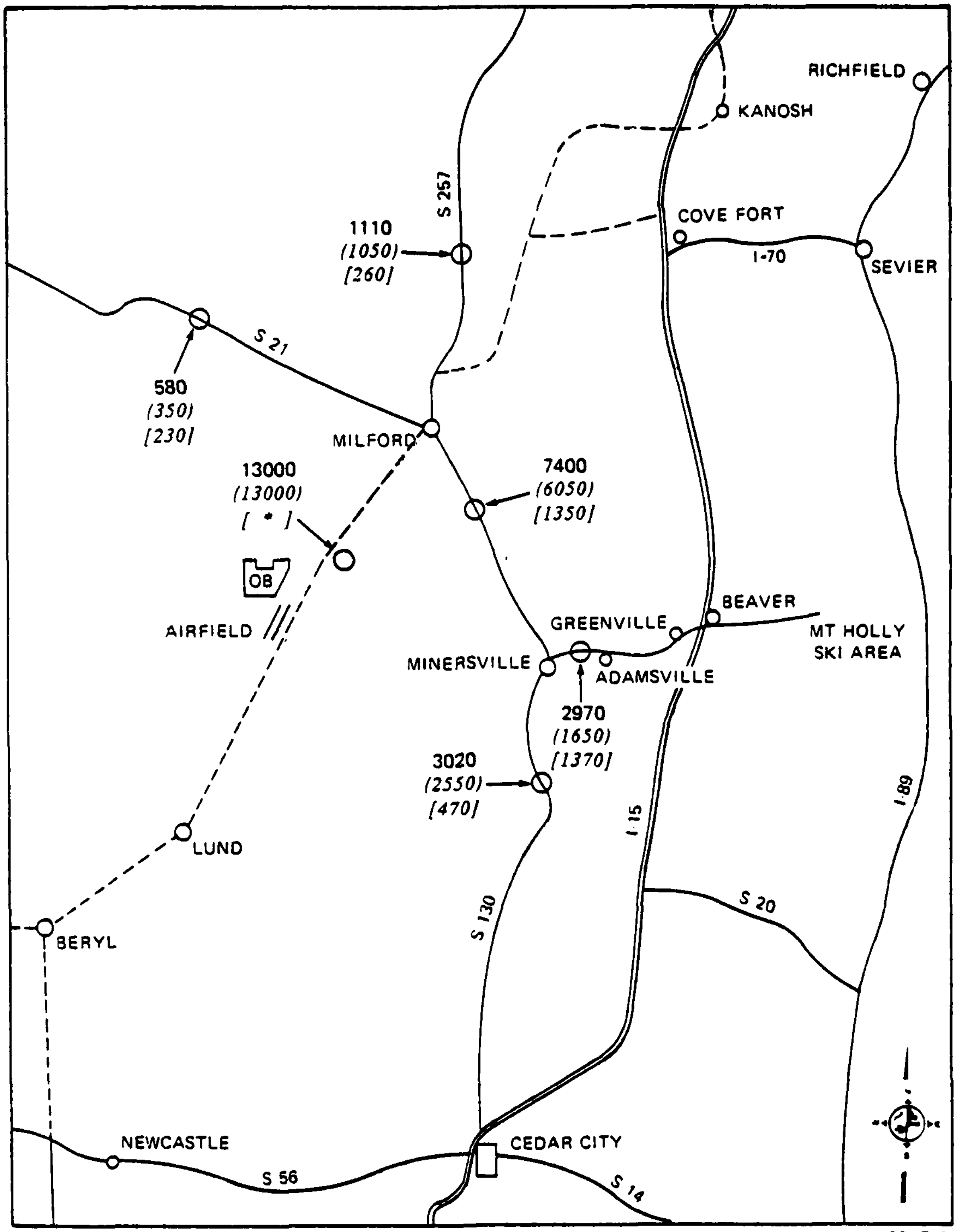
MILFORD, UTAH (4.3.5)

The population increases associated with construction and operation of an operating base near Milford would have a corresponding impact on traffic in the surrounding area. In general, the impacts would be similar to those discussed for the Beryl site in Section 4.3.1.

The largest amount of offbase development is expected to occur in Milford. The community of Milford and the road connection between it and the base would be significantly affected by construction and operation of the operating base. Traffic along the road between the two would be high. Since a significant portion of off-base growth is also expected to occur in Minersville, Beaver, Cedar City, and the other small communities south and east of Milford, improvement of the existing county road between Minersville and the proposed site could direct a significant portion of traffic to that route that would otherwise have to pass through Milford. Under the Proposed Action nearly 10,000 trips per day will be made between the base and neighboring communities. About 20 percent more would use it under Alternative 5 in which Milford would be the first operating base. Figures 4.3.5-1 and 4.3.5-2 present anticipated 1992 traffic for the two scenarios. Refer to Section 4.3.1 for a discussion on the assumptions on traffic generation.

The community of Milford would more than double in size under anticipated growth scenarios. Increases in traffic would be proportioned to overall growth. The anticipated in-migration of over 1,800 new households into the area would generate around 18,000 trips, or traffic movements daily. Provisions to accommodate this growth, including new streets as well as new housing, would have to be developed. Good planning and orderly development can prevent many traffic problems from occurring, but road improvements will undoubtedly have to be made at numerous locations on the existing street system to accommodate the anticipated traffic. Where these improvements would be needed will depend upon the specific growth patterns that develop.

The community of Minersville will also experience an increase in traffic both from new residences and from traffic passing through it between Beaver and Cedar City and the operating base. Some localized traffic problems requiring improvements will likely occur.



LEGEND 000 - TOTAL 1992 TRAFFIC
(000) MX TRAFFIC
[000] 1992 TRAFFIC WITHOUT MX

SCHEMATIC: NOT TO SCALE

Figure 4.3.5-1. Projected traffic volumes in the vicinity of Milford, Utah - first operating base.

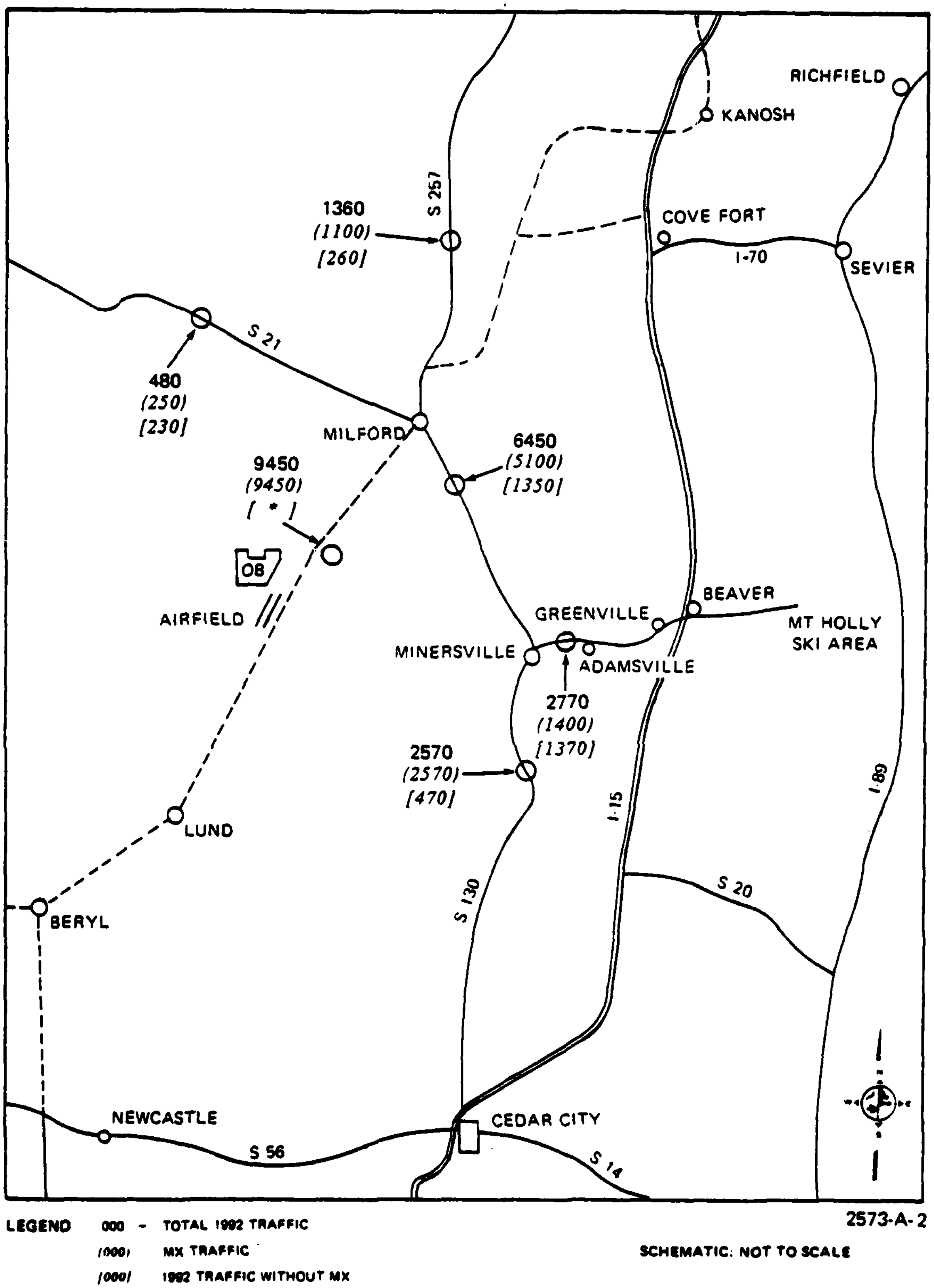


Figure 4.3.5-2. Projected traffic volumes in the vicinity of Milford, Utah - second operating base.

CLOVIS, NEW MEXICO (4.3.6)

Construction of an operating base at Clovis would actually involve expansion of an existing facility, Cannon Air Force Base. Therefore, traffic patterns in the area are not expected to change although the volume of traffic near the operating base would increase substantially. The portion of U.S. 60 between the operating base and Clovis would have a large increase in traffic as a result of the project but the existing four-lane road should be able to accommodate it. However, some modifications or improvements may be needed at critical intersections. Figure 4.3.6-1 presents anticipated future traffic for the vicinity. Refer to Section 4.3.1 for a discussion of traffic generation.

The in-migration of over 2,000 new households would generate around 20,000 trips or traffic movements within communities near the base. Most of the off-base development would likely occur within Clovis or its suburbs. Consequently, localized short-term congestion could develop at some locations, especially along approaches to U.S. 60 during peak periods, and some modifications or improvements to the street system may be needed at those locations.

The other communities within the area should not be significantly affected by increases in traffic associated with the project, although some critical locations where traffic concentrations occur may need to be modified or improved.

DALHART, TEXAS (4.3.7)

The population increases associated with construction and operation of an operating base near Dalhart would have a corresponding impact on traffic in the surrounding area. In general, the impacts would be similar to those discussed for the Beryl site in Section 4.3.1.

The proposed site is located approximately 10 mi southwest of the city of Dalhart. U.S. 54 would provide the main access to the base from Dalhart and, consequently, would experience the largest increase in traffic. A minor county road also passes near the proposed site on the west side and this traffic analysis assumes that a connection would be made from it to the base. This road would then provide access to the communities of Hartley and Dumas and other points south and west. Figure 4.3.7-1 presents future traffic estimated for the vicinity. Refer to Section 4.3.1 for a discussion on traffic generation.

The anticipated in-migration of around 1,800 new households would generate around 18,000 trips, or traffic movements on an average day within Dallam, Moore and Hartley counties. Provisions, in the form of new streets in addition to new housing units, would have to be made to accommodate this growth. However, good planning and orderly development can prevent many traffic problems from developing. When, and to what extent, specific improvements would be required will depend upon the growth patterns that develop. Nevertheless, localized traffic problems would occur at a number of locations on the existing street system within the communities and modifications and improvements would be necessary. The communities likely to be affected the most are Dalhart and Hartley.

Dumas would also experience increased traffic although not to the same extent since it is farther from the base site, and, since it is a larger community, the impacts would probably not be significant.

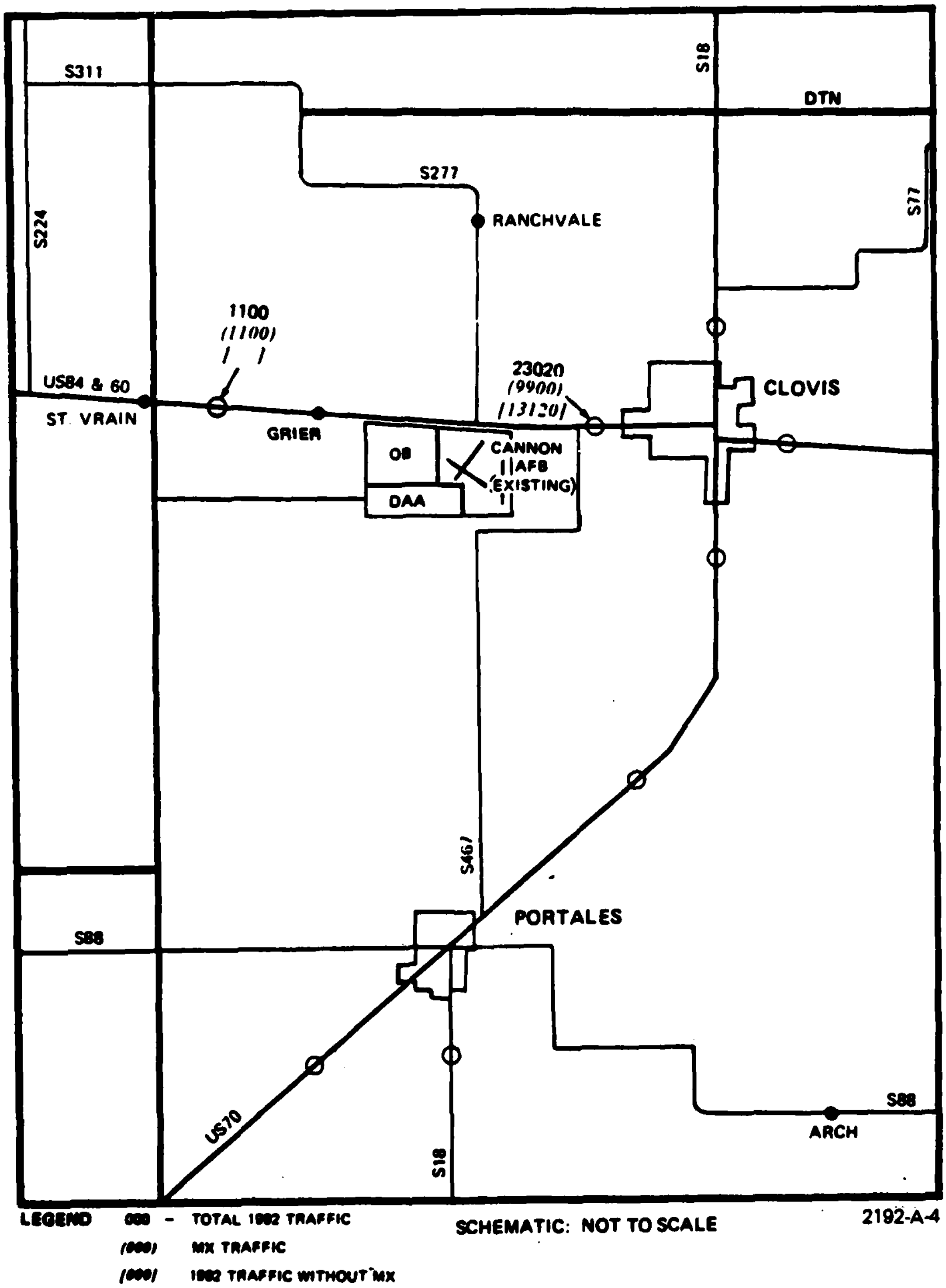
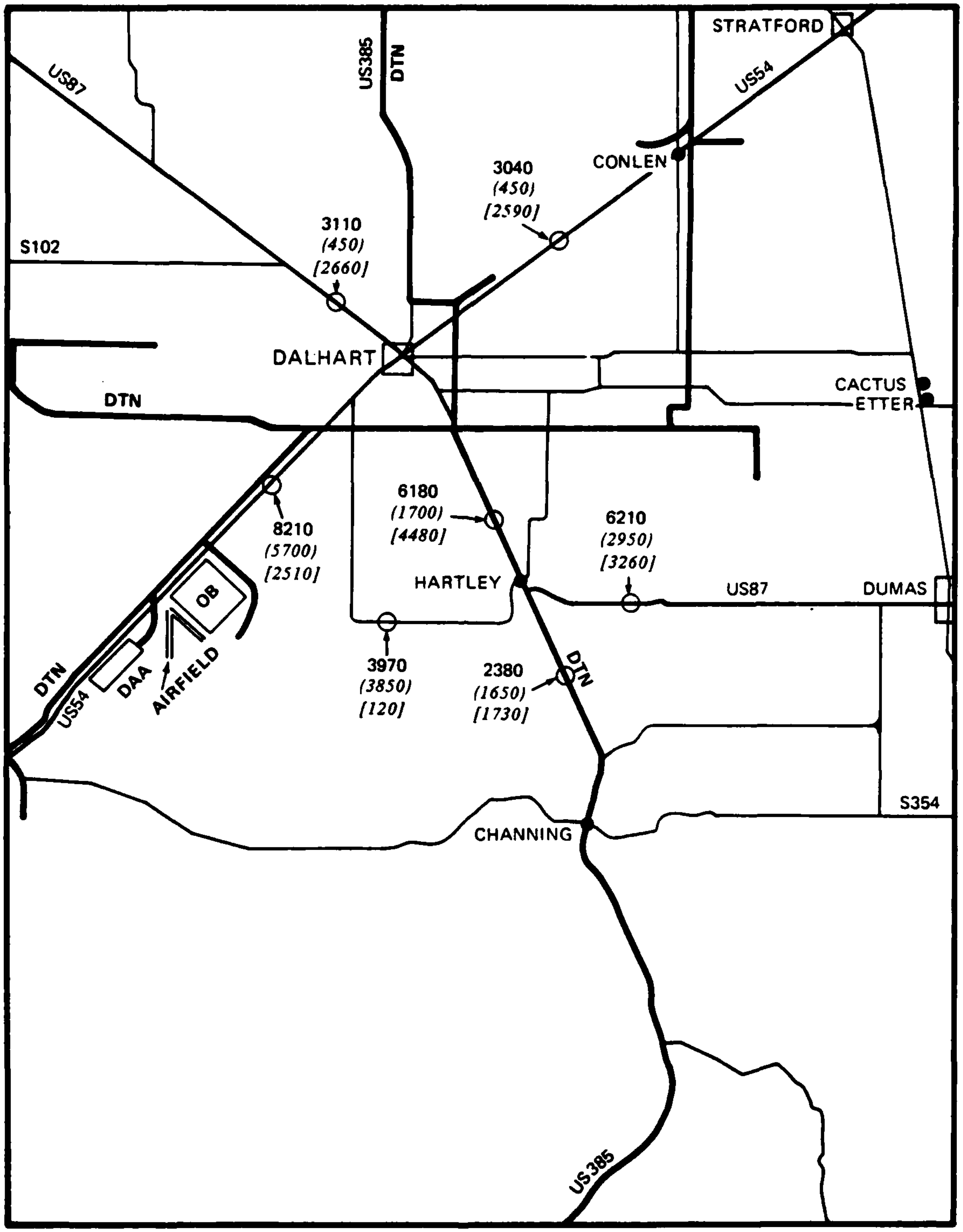


Figure 4.3.6-1. Projected traffic volumes in the vicinity of Clovis, New Mexico - first operating base.



LEGEND 000 - TOTAL 1992 TRAFFIC
(000) - MX TRAFFIC
[000] - 1992 TRAFFIC WITHOUT MX

SCHEMATIC: NOT TO SCALE

2189- -A-1

Figure 4.3.7-1. Projected traffic volumes in the vicinity of Dalhart, Texas - second operating base.

5.0 MITIGATION MEASURES

There are a number of potential mitigation measures that could be implemented to lessen the impacts on transportation facilities due to the M-X project. Primarily these involve measures to reduce the amount of traffic that would be generated by the project or to reduce potential conflicts between M-X traffic and non-M-X traffic on existing roads.

5.1 CONSTRUCTION

1. Temporary facilities, such as construction camps, should be located to avoid channeling undesirable amounts of traffic through small communities or through road segments with inadequate available capacity.

2. Road segments or intersections along existing roads where capacity is likely to be approached or exceeded due to project-related traffic should be identified during the design stage so that appropriate improvements can be made before traffic problems occur. These improvements may include roadway widening, truck climbing lanes, improved traffic control devices, overpasses, or various other measures.

3. Construction traffic should be required to use project roads to the maximum extent possible.

4. Buses or carpools should be used to transport construction workers between the work areas and neighboring communities. Where possible, staggered work shifts should be used to reduce peaking.

5. When conflicts between construction traffic and traffic on existing roads cannot be avoided, measures should be implemented to reduce traffic delays to a minimum and to assure safe operating conditions. Possible measures include construction of detours, temporary signing, use of flagmen, and temporary traffic signals.

6. Areas where temporary housing or other facilities to accommodate construction workers and their dependents are likely to develop should be identified early and properly planned for to assume orderly development and an adequate road network.

5.2 OPERATIONS

1 Buses and carpools should be used to carry commuter traffic between the neighboring communities and the operating bases.

2. Staggered work shifts should be used, if feasible, to lessen peak period traffic on roads to the operating bases.

3. Traffic between the operating bases and the DDA facilities that would cause operational problems if it used existing road should be required to use project roads.

4. Efforts should be implemented to ensure orderly growth and controlled development in areas near the operating bases that will accommodate base

employees and their dependents that are not provided housing on the base. This includes construction of a good road system in new developments and upgrading existing roads where necessary.

6.0 METHODOLOGY AND ASSUMPTIONS - TRAFFIC ESTIMATES

The following sections describe the methodology and assumptions used to estimate the volume of traffic associated with construction and operation of the M-X system. The analysis procedures for the deployment areas (DDA) and the areas surrounding the operating bases are described separately, since the analysis techniques and assumptions are slightly different. In both cases standard traffic forecasting and traffic analysis techniques were used.

The first section discusses the basic theory and applications of traffic forecasting. The second section applies these theories to the specific requirements of this project and includes the basic assumptions and procedures used to estimate the traffic impacts in the vicinity of the bases. The third section presents the assumptions and procedures used to estimate the traffic impacts in the deployment area. The last section describes the procedures for estimating the capacity of a road segment.

6.1 THEORY OF TRAFFIC FORECASTING

Travel by any method is a means for satisfying a desire to go from one place to another. The amount of travel depends on population: how much of it there is and where it is in relation to where it intends to go. It is also related to economic activity, to land use activity and intensity, and to life style. Travel by motor vehicles is measured by the number of vehicles on a particular segment of road which is called traffic. Methods to forecast and project future traffic are well established in the highway planning process. Underlying the ability to forecast future traffic volumes and patterns for an area is the ability to first understand the relationship between travel and land use (and other socioeconomic factors), and secondly to accurately forecast population, economic activity, and land use.

The basic theory of transportation planning is that there is an order in human behavior, or, in other words, that trip making has a high degree of regularity and orderliness (e.g., the same trip to and from work five days each week). If travel were random or chaotic, it would not be possible to reasonably project traffic volumes or patterns. However, orderliness in travel enhances "predictability," and thus provides the basis for traffic forecasting. The regularity of observed travel behavior makes possible reasonably reliable predictions of future travel patterns based on forecasts of future population, employment distribution and characteristics, and other variables. However, because of this inherent dependence, traffic forecasting is only as reliable as the other forecasts, such as population and land use, upon which it is based.

Forecasting procedures have been classified into two basic groups: mechanical and analytical. Mechanical methods examine and define past trends of traffic growth, and project them into the future, assuming that future experience will follow a pattern established by past experience (for example, traffic has been increasing at the rate of 2 percent per year and will continue to increase at that rate). Analytical techniques first attempt to determine the factors that influence travel patterns, and then express them in a mathematical relationship. Then, significant changes in any of these factors (such as the construction of a new military base) can be evaluated in terms of these relationships with reasonable assurance that the consequent change in travel patterns can be accurately

predicted. The mechanical method was used to estimate future traffic without the project and the analytical method was used to estimate the M-X-related traffic. Briefly, the analytical method used in the study is composed of the following steps:

- FORECASTING - examining the existing condition, and then predicting, or estimating, what changes there will be to significant factors such as population and land use activity or intensity.

- TRIP GENERATION/TRIP DISTRIBUTION - determining the number of trips generated from an activity, land use, or location, breaking trips down by trip purpose, and distributing those trips to specific destinations.

- TRIP (TRAFFIC) ASSIGNMENT - Assigning trips (traffic) to an existing or proposed transportation network.

6.2 METHOD OF ANALYSIS - OPERATING BASES

The following section discusses in further detail each of the steps of the analytical process used in this report and the specific assumption and procedures used to estimate the volume of traffic near the operating bases.

FORECASTING

Two different estimates were necessary in this analysis: determination of future baseline traffic without the M-X project; and projection of the additional traffic that would be generated if the project is constructed.

The future baseline traffic was estimated by examining current traffic data, evaluating population trends in the vicinity of the proposed base sites (without the base in place), and then by translating these population changes into traffic changes. Current traffic data were obtained from the various states within the study areas. This information was typically in the form of annual average daily traffic volumes (AADT, or more commonly ADT). "Current" traffic was a relative term, as the available data ranged from 1975 to 1979 statistics, depending upon the state.

Evaluation of population trends was based upon an analysis of socioeconomic trends. (These trends are discussed in detail in ETR-565.) The trends range from zero growth to significant increases in population (as much as 80 percent) in the vicinities of the various proposed base sites. These changes in population, in the isolated areas in which they occur, can be equated with corresponding changes in traffic volumes. Thus, if population was predicted to increase by 20 percent, traffic volumes were assumed to increase approximately 20 percent. The figures in Section 4 show the 1992 traffic projections based upon those trends.

A different procedure was used to project M-X-related traffic. This is because most of the traffic impacts associated with the M-X project will be caused by persons who are employed on the base but who are living offbase in neighboring communities. Because construction of the base would be a major change in the baseline conditions, examination of past trends could not account for base-related traffic. The traffic associated with persons who move into the area will be examined first, followed by examination of the change in traffic patterns of persons

who currently live in the area and take jobs on the base. The trips generated by persons who move into the area as a result of the base but who do not work on the base itself are also examined.

The alternative base locations and total base employment and population were provided by the Air Force. The Air Force predicts that 20 percent of the military personnel and all of the civilian employees would reside off the base in neighboring communities, as would all of the additional in-migrants not employed on the base. (Refer to ETR-565 for a discussion of the method of projecting this indirect growth.) Where these people would reside directly influences where and to what extent traffic impacts would occur, therefore it was necessary to allocate these people to each of the communities in the analysis unit are projected. The desired end product is the identification and quantification of trips beginning and/or ending in the various analysis units within a transportation study area. Trip generation is related to the use of land, and land use is most often described in terms of intensity, character, and location of activities. Trip generation, in general, is influenced by such factors as automobile ownership, income, household size, availability of public transportation, density of development, and the quality of the transportation system. Trip generation is generally given in trip generation rates, such as trips per household type, trips per 1,000 square feet of office space, trips per employee, etc. The analysis units for this study are the base and its various satellite communities. Further breakdown of analysis units within each of the communities was not considered reasonable since the communities were generally small and further breakdowns would not significantly add to the identification of impacts.

Although there are numerous possible trip purposes (work, shopping, school, recreation, etc.), this study breaks all trips down into three categories: homebased work, homebased nonwork, and nonhomebased. This will give a sufficiently detailed breakdown of trip purposes to make a reasonable projection of traffic volumes and distribution.

Transportation studies have shown that the number of trips per household vary from approximately 5 to 10 per day for residences. These allocations were based upon the number and proximity of existing communities and the correspondent size of those communities' infrastructures; the availability and adequacy of the existing transportation network; the existing land use planning policies; land ownership; and other factors. These factors were applied based upon the particular character of each of the study sites. First candidate communities where offbase personnel could be expected to locate were identified. Next, relative proportions of the total offbase population were allocated to each of the candidate communities. When the candidate communities did not appear adequate to absorb the total population needing offbase housing, or when as an aggregate they were too far away, it was assumed that a "new town" would develop near the base to accommodate some of the population.

These population allocations were made for traffic distribution/assignment only in order to identify the traffic impacts associated with the location of an operating base. While actual growth may be considerably different, these allocations give an indication of the impacts which could be expected.

TRIP GENERATION

Once the number of people who will live on the base and within each of the neighboring communities is established, the next step is to estimate appropriate trip generation rates. Trip generation is the analytical process by which the number of trips that will originate and/or terminate within an hour for types of housing such as mobile homes, apartments, single family detached houses, and others. For this analysis 8.0 homebased trips per household was used. Besides these homebased trips, it was assumed that an additional 2.0 nonhomebased trips per household would be generated.

The homebased trips were distributed 40 percent work related and 60 percent nonwork trips. This amounts to 3.2 trips per day per household to work and 4.8 trips to other destinations. Of the work trips, it is assumed that there would be 2.1 trips per household to the base (this is slightly over 1 round trip each day). The remaining work trips would be for base employee's dependents working in other areas. (Work trips for a household not having a person employed at the base are distributed differently; see the following section on indirect households.) Of the remaining work trips, it is assumed that 45 percent would be to adjacent communities and 55 percent would be within the community where the trip originated. The nonwork trips were distributed 20 percent to the base, 30 percent to the originating community, and 50 percent internal to the originating community. The nonhome-based trips were distributed 35 percent to the base, 15 percent external to the originating community, and 50 percent internal to the originating community.

Some of the base employment will be taken by persons already living in the neighboring communities. The number of trips made by these people will not change significantly, but the trip patterns will. It is assumed that two additional trips per day (one round trip) will be made by each of the individuals between their home and the base. Their other trips were assumed to remain the same and, therefore, they are already included in the baseline trips.

For purposes of this report, indirect trips are defined as those trips associated with persons who move into the area as a result of employment opportunities associated with the operating base, but who do not work on the base itself. The actual forecasting of the number of these people was carried out through econometric modeling, which is discussed in ETR-565. The same trip generation rate that was used for base employees is used for indirect trips, except that no trips are assumed destined for the base.

Trips made by persons living on the base is estimated differently. This is primarily because the makeup of the population is substantially different than in civilian communities with large portions of the military employees being single and living in barrack-type housing. Moreover, because of the facilities available on the base, such as shopping, recreation and, of course, employment, there are considerably fewer inducements to make trips off of the base. The study assumes that each base employee, including those with dependents, would generate one round trip offbase every other day either himself or a member of his family. The trips made totally within the base were not examined at length because they would not use the existing road systems and therefore would not cause an impact off the base.

TRAFFIC ASSIGNMENT

Once the total number of trips originating within each community or on the base was determined along with the trip purpose (e.g., work trip to the base, homebased nonwork trip to another community, etc.) it is necessary to assign the trips to the road network. In this analysis, traffic assignments were almost automatic as generally there was only one direct route between any two points. In all cases traffic was assigned to the most direct route. The total volume of traffic on any road segment therefore is the sum of the individual assignments.

6.3 METHOD OF ANALYSIS - DEPLOYMENT AREA

CONSTRUCTION TRAFFIC

The following is a discussion of the methodology used to compute peak-day construction traffic for the MX project. The source of information was the computer printouts prepared in conjunction with the construction model. (Refer to ETR-3 for a description of the construction made.)

1. The first step was to compute peak and non-peak rates of construction for the three basic components of the M-X project: the shelters, cluster roads, and DTN. Peak rates of construction occur when all activities associated with construction of a component are under way simultaneously. Non-peak rates occur at the beginning and end of the construction period when some but not all activities are underway.

2. After-peak and non-peak rates of construction were identified for each phase of construction (shelters, cluster roads, DTN), these daily rates were then used to compute daily quantities required for these items. The quantity requirements are outlined in the construction model. For example, each shelter will contain approximately 624 cubic yards of concrete. Assumptions were then made regarding the hauling capacity of each type of truck, for example, 12 cubic yards per concrete truck. By applying these factors, we can then come up with a number of daily trucks required in a construction group for a particular phase of construction. To this is added personnel traffic from the construction camp, computed on the basis of total construction camp personnel using the following assumptions:

    - o 10 percent of total construction personnel would be Corps of Engineers employees who would utilize shall vehicles at 2 persons per vehicles.
    - o 30 percent of total construction personnel would utilize small vehicles at 3 persons per vehicle.
    - o 30 percent of total construction personnel would be transported to work sites in large buses at 20 persons per vehicles.
    - o Remainder of personnel to remain at camp, operating plants, maintaining equipment, etc.

3. The next step was to compute the peak-day traffic. This was determined by estimating periods when more than one of the major construction activities - shelters, cluster roads, and DTN - occurred simultaneously. By noting periods when simultaneous activities would occur, the peak-day traffic was determined. For example, during a portion of the project it would be likely to have peak-day DTN construction and peak-day cluster road constructing occurring simultaneously for a period of time. By adding up the traffic associated with each of these activities, composite peak-day traffic on the DTN for a construction group can be calculated.

It should be noted that the calculations of peak-day traffic for the various construction items indicated in No. 2 concentrated only on those traffic volumes which would occur on the DTN and did not include those trucks which travelled exclusively on the cluster roads, such as water trucks used for revegetation and dust control. These trucks would probably have access to a well within the cluster and would not go outside the cluster boundary onto the DTN. It was assumed that the peak-day traffic on the DTN would more than exceed the peak-day traffic on the cluster roads.

Another assumption in arriving at the peak-day traffic rates was the amount of irrigated revegetation which would be required. The technical report on water outlined three scenarios for the revegetation: no revegetation in which no irrigation is performed in conjunction with revegetation; partial revegetation in which irrigation is used in conjunction with revegetation only at shelter sites; and full revegetation in which irrigation is used wherever revegetation is performed. For the purposes this analysis and to be consistent with the Water Technical Report, we assumed that only partial revegetation would be used in Nevada/Utah, and no revegetation would be used in Texas/New Mexico. This has a significant effect on the traffic volumes since water trucks make up a substantial portion of the traffic involved.

4. After peak-day construction traffic was determined by the above methods, the additional traffic associated with A&C0 personnel was determined. The number of A&CO personnel required for each year of construction was provided by the Air Force. These personnel were allocated to each of the construction camps in proportion to the number of shelters which would be constructed by each of them. Three different types of trips were calculated, including bus trips, van trips, and single vehicle trips. After these trips were computed on a daily basis this traffic was overlaid on the peak-day construction traffic to determine composite traffic consisting of A&CO and construction personnel.

COMMUTING AND RECREATION TRAFFIC

This analysis assumes that a portion of the construction and A&CO personnel will choose to establish living quarters away from the construction camps depending on the available amenities offered by nearby communities. The majority of these trips will be via the existing road network between the construction camps and nearby communities and will be made by passenger vehicles, principally during a one-hour band bracketing the normal work hours.

In addition to the above daily work trips, these personnel are also assumed to take several recreation-oriented trips during the construction period. These trips will be taken primarily on weekends and will utilize the existing highway system. Since both the commute and recreational trips occur during different time periods, they require separate analysis.

In computing the construction camp commuting trips, a percentage of the total construction camp personnel was assumed to reside in one or more nearby communities during each year of camp operation. An assumed ridership of 1.25 passengers per vehicle was applied to total construction camp personnel, from which round trips per work day were calculated. The round trips were then doubled to obtain daily one-way vehicle trips, which were then assigned to the existing highway system.

The construction camp recreational trips were calculated assuming that on the peak day such as Friday, 90 percent of the available construction personnel would embark on recreational trips. Recreational trips were assumed to have a ridership rate of two passengers per vehicle. The round trips were then assigned to various destinations according to the distance and relative attraction of each destination. At this point, recreational round trips to each assumed to the existing highway network. Neither the commuter nor the recreational trips shown in Section 4 include A&CO personnel since peak A&CO activities are not expected to occur at the same time as peak construction although they will overlap to some degree. It is not expected however that combined A&CO and contruction traffic will exceed the peak construction traffic levels.

6.4 CAPACITY ANALYSIS

Once traffic is assigned by these procedures it is necessary to examine each segment of road to determine if it has the capacity to accommodate the anticipated volume of traffic. Capacity is defined as the maximum traffic volume per unit of time that can be handled by a given roadway segment under prevailing conditions.

As a quantitative measure, capacity is affected by roadway factors and traffic factors. Roadway factors are physical elements of the roadway design which may have restrictive effects on capacity. These physical elements include: lane width, lateral clearance shoulders, auxiliary lanes, surface conditions, alignment, and grade. Narrow lanes and limited lateral clearance, poor surface conditions and alignment, and high grades, for example, all adversely affect the capacity of a given roadway segment.

Roadway segments of identical geometrics, however, may not necessarily have equal capacities. This is due to the effect of traffic factors on capacity; that is, the composition and characteristics of the traffic which uses the road. The traffic factors considered in estimating capacity are: the percentage of trucks and buses in the traffic stream, percentage of turning vehicles, weaving and merging and other traffic interruptions. These factors, when taken as a whole with the roadway factors, describe the prevailing conditions of a given roadway.

As a result of extensive traffic volume observations and speed-volume relationship studies, numerical values of capacity for different types of roadways under ideal conditions have been determined. Ideal conditions assume uninterrupted

traffic flow consisting of passenger cars only, along a roadway with 12-foot wide lanes, adequate shoulders, and alignment that allows average speeds of 70 mph or greater. Based on those assumptions, capacities of 2,000 passenger cars per hour, total, for two-lane roadways have been established.

The ideal condition capacities must be modified, however, to reflect the effects of the roadway and traffic factors previously mentioned. Correcting ideal capacity for trucks, varying lane widths, grades, lateral clearance, and other factors will still result in capacities of 1,000 to 1,700 vehicles per hour for most well-designed roadways.

Although capacities are usually computed in terms of vehicles per hour, if an average peak hour factor is assumed, daily capacities can be estimated. For a peak hour factor is assumed, daily capacities can be estimated. For a peak hour factor of 15 percent, assuming an 11-foot land width, no lateral obstructions, and 10 percent trucks in the traffic flow, a daily capacity of 10,000 to 11,000 vehicles is indicated for two-lane roadways on level terrain. The capacity of a four-lane roadway under the same conditions with 12-foot lanes is approximately 48,000 vehicles per day.

When performing a capacity analysis, the first step is the determination of the capacity (supply) of the various segments of the highway system. Existing or future traffic volumes are then imposed upon each segment (demand). Relationships are then established between demand and supply, volume and capacity. Obviously, if demand exceeds supply, congestion will occur. The goal of this phase of the analysis is to identity ahead of time where demand will exceed supply so that supply can be increased, or demand redirected. Increasing supply, that is increasing capacity, can range from minor intersection improvements, to minor geometric modifications of sections of roadway, to providing additional lanes to a highway.

7.0 EFFECTS ON RAILROADS AND AIRLINES

7.1 RAILROADS - NEVADA/UTAH

Two railroads currently serve the Nevada/Utah area under consideration. The Nevada Northern Railroad has its southern terminus in Ruth, Nevada, which is about 10 mi northwest of Ely. This line runs north and south and provides rail service to Ely, McGill, Warm Springs, and Currie, Nevada and intersects with the Western Pacific Railroad near Shafter. Western Pacific runs east and west across Nevada and Utah and provides rail connections to other major railroads.

The other railroad is a Union Pacific main line which connects Salt Lake City, Utah and Las Vegas, Nevada. It provides good rail access to the proposed base location at Delta, Milford, and Beryl, Utah, among other communities.

Under the conceptual construction schedules discussed in the DEIS, during the peak construction year, 1987, approximately 160 carloads per week would be required for the Proposed Action and alternatives 1 through 6. Fewer deliveries would be required in other years. Based upon its proximity to the system, most of the deliveries would probably be made by Union Pacific. The existing line is well maintained and the additional freight should not adversely affect the rail line nor interfere with service to the other customers but will provide additional revenue to the company. The Northern Nevada rail line is a lesser-used narrow-gauge track. Depending upon the amount and size of the deliveries some upgrading or additional maintenance may be required to accommodate the additional freight, but the additional traffic would also provide new revenues to the company.

7.2 RAILROADS - TEXAS/NEW MEXICO

Three railroads provide service to the Texas/New Mexico region currently under consideration for the deployment area. The Chicago, Rock Island and Pacific Railroad runs east and west through the area via Vaughn, New Mexico and Amarillo, Texas with a branch line that runs northeast to Oklahoma through Dalhart. The Atchinson, Topeka and Santa Fe Railroad also has lines in the area serving Vaughn, Clovis, Dalhart, Amarillo, and other cities. The Colorado and Southern Railroad services the northern part of the proposed deployment area with a line running through Dalhart and Amarillo.

Under the conceptual construction schedule contained in the DEIS, approximately 160 carloads per week would be required in 1987. Fewer deliveries would be required in other years. Because of their proximities to the area, most of the deliveries would probably be on the Chicago, Rock Island and Pacific and the Atchinson, Topeka and Santa Fe railroads. The additional freight should not adversely affect the railroads and would provide them with additional revenue.

7.3 AIRLINES - NEVADA/UTAH

Commercial airline service to the proposed deployment area is provided through major commercial airports at Las Vegas and Reno, Nevada and Salt Lake City, Delta, and Cedar City, Utah. There are also a number of other private and public airstrips throughout the area. The increase in population resulting from construction and operation of the M-X facilities would increase demand for

commercial airline service to the region. This increased demand is expected to be accommodated at existing airport facilities.

7.4 AIRLINES - TEXAS/NEW MEXICO

Airline service is provided to the area through commercial airports at Clovis and Roswell, New Mexico and Lubbock and Amarillo, Texas. The construction and operation of the M-X system will increase demand for commercial airline service but the increase should not be too large compared to current demand and the existing airports should be able to accommodate it.

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*U.S. GOVERNMENT PRINTING OFFICE : 1981 0-723/284


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